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COMMONWEALTH MYCOLOGICAL INSTITUTE

REVIEW
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C. A. B.
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FILE

PETERSEN (D. H.). **Additional hosts of Glomerella cingulata in the families of Gramineae and Leguminosae.**—*Plant Dis. Reptr*, 39, 7, pp. 576–577, 1955. [Multilithed.]

Seedlings of 39 species of forage plants associated with peach orchards in South Carolina were inoculated in the greenhouse with *Glomerella cingulata* to determine their susceptibility and their function as possible sources of anthracnose infection in orchards where the fungus does not overwinter on blue lupins (*Lupinus angustifolius*) [*R.A.M.*, 32, p. 198]. Susceptible plants included two species of Gramineae and 15 of Leguminosae not listed in the Index of Plant Diseases in the United States [32, p. 580].

CIFERRI (R.), RUI (D.), SCARAMUZZI (G.), & CANDUSSIO (R.). **La 'leptonecrosi' nutrizionale del Pesco. Parte II.** [Nutritional 'leptonecrosis' of Peach. Part II.]—*Ann. Sper. agr.*, N.S., 9, 2, pp. 235–262, 1 diag., 1955. [English summary.]

In this concluding part of the present paper an account is given of manurial experiments carried out in Italy which demonstrated that most of the symptoms of non-parasitic leptonecrosis of peach trees [*R.A.M.*, 35, p. 304] are caused, apparently, by deficiency of potassium and phosphorus. The symptoms disappeared, however, only when these substances were applied with organic fertilizers, which probably increased their availability. The formula recommended for general use with three-year-old trees is 30 to 40 kg. of stable manure mixed with 240 gm. of potassium sulphate, 500 gm. of superphosphate, and 200 gm. of ammonium sulphate per tree. For older trees these amounts should be increased proportionately. The application should be made at the end of February and well worked in. About the middle of March and again one month later 50 to 60 gm. of calcium nitrate should be sprinkled round the base of each tree. A list of 24 references (mostly Italian) is given.

LENTZ (P. L.). **Microstroma tonellianum on sweet Cherries.**—*Plant Dis. Reptr*, 39, 9, p. 697, 1955. [Multilithed.]

Microstroma tonellianum [cf. *R.A.M.*, 31, p. 245], found on diseased cherry fruits from the University of Massachusetts Field Station, Waltham, has not been previously reported on cherry, and is believed to be a new record of this fungus for North America unless a *Microstroma* described on peach [loc. cit.] is the same species.

REEVES (E. L.), CHENEY (P. W.), & MILBRATH (J. A.). **Normal-appearing Kwanzan and Shiro-fugen oriental flowering Cherries found to carry a virus of little cherry type.**—*Plant Dis. Reptr*, 39, 10, pp. 725–726, 1955. [Multilithed.]

During recent studies in Washington and Oregon it was observed that when clones of Kwanzan and Shiro-fugen flowering cherries (*Prunus serrulata*), both

extensively used as indicator plants for the presence of [cherry necrotic] ring spot viruses in stone fruits (*Bull. Ore. agric. Exp. Sta.* 522, 27 pp., 1954), were budded into or grown on fruiting Lambert and Bing sweet cherries they caused the latter to develop a serious small fruit condition reminiscent of the little cherry disease of British Columbia [*R.A.M.*, 35, pp. 158, 200]. Symptoms developed when the Lambert and Bing trees first fruited and were confined to the fruits, which were small, lacking in colour, more pointed, and in Lambert more angular than normal. Affected fruits in Oregon had bilateral depressions, somewhat different from the typical little cherry symptoms of those in Washington. Since it now appears that some stocks of apparently healthy flowering cherries carry a potentially dangerous virus, a search for virus-free sources of Kwanzan and Shiro-fugen is required.

Gilmer (R. M.). **Evaluation of various fungicides and application schedules in the control of diseases of Cherry nursery stocks.**—*Plant Dis. Reptr*, 39, 10, pp. 762–770, 1955. [Multilithed.]

Trials carried out at the New York State Agricultural Experiment Station, Geneva, from 1951 to 1955, inclusive, showed that timing of the initial application and choice of fungicide are critical for the control of powdery mildew (*Podosphaera oxyacanthae*) and leaf spot (*Coccomyces hiemalis*) [*R.A.M.*, 31, p. 129; 33, p. 37] on cherry nursery stocks. Under western New York conditions the initial application should be made 10 to 14 days after bud-break (generally about 10th to 15th June). Of the fungicides tested, actidione (2 p.p.m.) in a four-application schedule at 14-day intervals gave outstanding control of leaf spot, though not of powdery mildew, but it was compatible with sulphur for increasing the degree of control of the latter. A combination of actidione and sulphur (2 to 5 lb. per 100 gals.) in the same schedule controlled both diseases. Copper fungicides (0·4 lb. metallic copper) gave good control of leaf spot alone. Other fungicides tested were not so satisfactory.

Shneider (Y. I.). Дырчатая пятнистость Абрикосов в Краснодарском крае. [Shot hole of Apricots in the Krasnodar region.]—Микробиология [*Microbiology, Moscow*], 23, 6, pp. 698–701, 1954.

Pseudomonas caucasicum n.sp., and not *Clasterosporium carpophilum* [*R.A.M.*, 17, p. 837], is stated to be responsible for shot hole of apricots and other *Prunus* spp. in the Krasnodar region of the U.S.S.R. At the Moscow Station of Plant Protection the bacterium was found to be Gram-negative and aerobic, with motile rods, 0·8 to 1·2 by 1·2 to 2 μ, produced singly, in pairs, or in chains, with no spores or capsules, and developing cream-coloured colonies on potato agar; gelatin was not liquified, milk was peptonized but not coagulated, litmus milk was both peptonized and coagulated, acid formed only from glucose and sucrose, nitrates were not reduced, starch not hydrolysed, and neither gas nor indole produced. The optimum growth temperature range was 20° to 25° [C.] and the maximum 30°. Infected trees serve as reservoirs and sources of re-infection in the spring.

Wishart (R. L.) & Smith (L. C.). **Apricot gummosis.**—*J. Dep. Agric. S. Aust.*, 59, 6, pp. 212–213, 243, 1 fig., 1956.

This information on apricot gummosis [caused by *Eutypa* sp.] in South Australia [*R.A.M.*, 35, pp. 356, 376] has already been noticed.

Vaughan (E. K.) & Wiedman (H. W.). **Transmission of a Rubus virus to Fragaria vesca.**—*Plant Dis. Reptr*, 39, 7, p. 542, 1955. [Multilithed.]

At the Department of Botany and Plant Pathology, Oregon Agricultural Experiment Station, Corvallis, a ring spot virus, possibly identical with raspberry decline in the United States [*R.A.M.*, 22, p. 318], yellow blotch curl in Canada, and yellow blotch in Scotland [32, p. 388], was graft-transmitted from Washington red rasp-

berries to the East Malling clone of *Fragaria vesca*. In the early stages the disease resembled the commonly observed virus diseases of strawberry, causing mottling and reduction of vigour, but the following spring the symptoms became very severe, with malformation of the flowers, sterility, and the production of numerous small plants on the fruit spurs. To the authors' knowledge this is the first report of the transmission of a virus from raspberry to strawberry.

Marrou (J.). **Méthode de lutte contre les maladies de dégénérescence du Fraisier.** [Method of control of degeneration diseases of the Strawberry.]—*Ann. Soc. Hort. Fr.*, 1, 4, pp. 92–95, 6 figs., 1955.

Heat therapy is now employed in France by the National Institute of Agricultural Research against strawberry degeneration caused by the yellow edge and crinkle viruses [cf. *R.A.M.*, 33, p. 679]. A number of varieties have already been regenerated by this method, including Vicomtesse Héricart de Thury. During the winter of 1954, nearly 1,000 plants were treated at the Central Station of Plant Pathology, Versailles; of these, 250 were pronounced healthy and were planted in special cages. From their progeny 6,500 daughter-plants were selected and are being remultiplied. It is hoped that by the autumn of 1956 it will be possible to distribute to selector-breeders 150,000 plants, or sufficient to stock 14 ha. of nursery-beds. The varieties accepted for certification include Madame Moutot, Surprise des Halles, Royal Sovereign, La Ladette, Fertilité, and Climax. Many others will shortly be released.

Krause (W. G. C.). **Virusziekten en aaltjes in de aardbeiteelt.** [Virus diseases and eelworms in Strawberry culture.]—*Cult. en Hand.*, 21, 4, pp. 171–174, 2 figs., 1955.

Virus diseases, especially crinkle and yellow edge, are one of the most important sources of damage to the economically very valuable Belgian strawberry crop. Their symptoms are briefly described, together with those of the two forms of the genetic variegation June yellows, 'transient yellows' and 'streak' [*R.A.M.*, 35, pp. 307, 377] and of green petal, recently reported from England [32, p. 632].

Plakidas (A. G.). **Virus diseases of Strawberry, a review.**—*Plant Dis. Reptr*, 39, 7, pp. 525–541, 5 figs., 1955. [Multilithed.]

This is a useful review of the literature (105 titles) on seven virus diseases of strawberry, namely, yellows [*R.A.M.*, 34, p. 532], crinkle [35, p. 29], witches' broom [6, p. 673], stunt [32, p. 323], leaf roll [21, p. 533], and western aster yellows [32, p. 683], all recorded in the United States, and green petal in England [see preceding abstract].

De Fluiter (H. J.). **Bestrijdingsmogelijkheden van de vector van de dwergziekte van de Framboos.** [Possibilities of combating the vector of the Raspberry stunt disease.]—Abs. in *Tijdschr. PlZiekt.*, 62, 1, p. 26, 1956.

In this paper, presented by F. A. v.d. Moor on the author's behalf at the Phytopathological Conference held at Wageningen on 3rd and 4th February, 1956, *Rubus* stunt virus, which is very destructive on raspberry in the Breda district of Holland [*R.A.M.*, 35, p. 374], is reported to be transmitted by the cicada *Macropsis fuscula* [34, p. 282]. In certain localities young plantings of healthy material are regularly infected year by year from an external source, the incidence of the virosis mostly reaching 50 to 90 per cent. by the second year, and thereafter remaining more or less constant. It is essential, therefore, to protect the first-year plantings by extermination of the vector.

M. fuscula may be combated by dormant sprays, e.g., of DNC, to destroy the eggs overwintering on the plants. Parathion or one of the other phosphoric acid esters

should be applied against the larvae at the onset of flowering. During the infection period of August to mid-September either systemic insecticides or phosphoric acid esters may be used to eliminate the adults. The success of the winter and spring treatments depends largely on the co-operative action of all or most of the local growers, but individuals may secure an important measure of control by spraying with 0·1 per cent. systox or parathion from 1st August onwards.

The experiments on which these recommendations are based also yielded evidence of a long period of latency of *Rubus* stunt virus in the cicada.

TOOLE (E. R.). **Twig blight and canker of Red Mulberry.**—*Plant Dis. Reptr*, 39, 8, p. 657, 1 fig., 1955. [Multilithed.]

Fusarium lateritium [*Gibberella lateritia*: cf. *R.A.M.*, 34, p. 233] was found to be responsible for twig blight of red mulberry (*Morus rubra*) in the Mississippi Delta in 1953. The author believes this to be the first record of the disease on *M. rubra*, though the fungus is widespread on *M. alba*.

GRANITI (A.). **Una nuova malattia dell'Olivo in Sicilia : la 'lebbra' o 'gleosporiosi'.** [A new disease of Olive in Sicily: 'leprosy' or 'gloeosporiosis'.]—Reprinted from *Tecn. agric.* 3–4, 4 pp., 2 figs., 1954. [Received March, 1956.]

This information concerning *Gloeosporium olivarum* on olive in Sicily has already been noticed from another source [*R.A.M.*, 33, p. 739].

ZENTMYER (G. A.), HALMA (F. F.), & WILHELM (S.). **Relative susceptibility of Guatemalan and Mexican Avocado rootstocks to Verticillium wilt.**—*Phytopathology*, 45, 11, pp. 635–636, 1955.

Although both Guatemalan and Mexican avocado rootstocks have proved susceptible to *Verticillium albo-atrum* in trial plots established in 1948 near Santa Barbara, California [*R.A.M.*, 29, p. 105], using the McArthur variety as a scion in all cases, the former are considerably more so than the latter. The same reactions were observed in greenhouse inoculation experiments, in which 22 out of 30 seedlings of the Dickinson, Nabal, and Anaheim varieties contracted infection on Guatemalan rootstocks compared with only nine of Mexicola, Ganter, and Topa-Topa on the Mexican.

RAI (J. N.). **Stylar end rot of the Guava fruit (Psidium guayava Linn.).**—*Proc. Indian Acad. Sci.*, Sect. B, 43, 1, pp. 55–61, 1 pl., 1956.

A study was made at Lucknow University, India, of a stylar end rot of guavas which was occasionally found on fruit in the orchard and more often on picked fruit. The disease originates in a discoloration of the area adjoining the persistent calyx. This extends, turning dark brown, the underlying mesocarp softens, and the whole fruit finally becomes soft and wrinkled, with pycnidia appearing on the surface. The causal organism is a species of *Phomopsis*. The pycnidia are 140 to 400 μ in diameter, averaging 225 μ, the conidia are 5 to 9 by 2·5 to 4 μ, and the stylospores, curved and hooked, are 16 to 32 by 0·8 to 1·5 μ. Infection was increased by injury.

CANNON (R. C.), BERRILL (F. W.), & KING (K.). **Can black heart of Pineapples be avoided?**—*Qd agric. J.*, 81, 6, pp. 321–328, 5 figs., 1955.

Pineapple black heart [*R.A.M.*, 21, p. 183] was serious in southern Queensland in 1954 and 1955. The precise cause of this physiological breakdown and its control still remain unknown. Since the greatest losses occur in July and August, harvesting during that period should be avoided. This can only be achieved through special crop management practices whereby a first ratoon crop is produced earlier than usual and the plant crop advanced a few weeks by means of artificial flower induction treatment. Careful selection of land for planting, fertilizing, and weed control are also important.

Jacks (H.) & Robbins (R. E.). **Compatibility of spray materials in New Zealand on Pears—1954.**—*Orchard. N.Z.*, 28, 1, p. 17, 1955.

Jacks (H.) & Hawkins (J. E.). **Compatibility of spray materials used in New Zealand on Apricots—1955.**—Ibid., 28, 3, p. 32, 1955.

Jacks (H.) & Rosser (H. W.). **Compatibility of spray materials used in New Zealand on Peaches—1955.**—Ibid., 28, 4, pp. 16–17, 1955.

Jacks (H.). **Incompatibility of spray materials.**—Ibid., 28, 8, *Suppl.*, 9 pp., 1955.

Useful charts have been prepared showing the compatibility and incompatibility of the fungicides and insecticides commonly used for spraying fruit trees in New Zealand. The information given should at present be regarded as tentative.

Holmes (E.). **Low volume spraying of fruit and Hops.**—*Agriculture, Lond.*, (formerly *J. Minist. Agric.*), 62, 12, pp. 583–586, 2 pl., 1956.

The writer considers that a hop sprayer must be narrow enough to traverse the alleys and short enough to be turned easily at the headlands. Large tank capacities are therefore out of the question and if spraying is to be speeded up lower volume sprays are required. Using an air-blast machine specially designed for hops in which an application rate of 25 gals. per acre enabled six to seven acres to be sprayed for each tank filling, it was found for downy and powdery mildews [*Pseudoperonospora humuli* and *Sphaerotheca humuli*] of hops that 25 gals. of cuprous oxide spray (50 per cent. copper) at 4 lb. per acre or dispersible sulphur (75 per cent.) at 8 to 10 lb. per acre for early application, and 35 gals. for the later, gave control.

Low-volume spraying of apples at 50 gals. per acre or less will control scab [*Venturia inaequalis*], using 2½ gals. lime-sulphur or 10 lb. dispersible sulphur to 50 gals. water. The rate for mercurial fungicide is 2½ lb. (1¼ in July) and for captan 5 lb. per 50 gals. per acre.

Rijsten (E. G.). **Ervaringen met enkele nieuwe fungiciden (voronit, tuzet).** [Experiences with some new fungicides (voronit, tuzet).]—Abs. in *Tijdschr. PlZiekt.*, 62, 1, pp. 26–27, 1956.

A new Bayer product known in neighbouring countries as cerenox or TB4452 b has been placed on the market in Holland under the name of voronit. It is quinonoximbenzoylhydrazone, which is recommended for the protection of maize, bean [*Phaseolus vulgaris*], and pea seed against [unspecified] damping-off fungi [cf. *R.A.M.*, 33, p. 543]. It is normally applied by means of a disinfectant drum or continuous machine at 2 gm. per kg. seed. In the writer's experiments voronit compared very favourably with thiram and mercurials, and an outstanding advantage is its slight toxicity and freedom from irritant effects on the skin and mucous membranes.

Tuzet is a combination of thiram, ziram, and urbacide (an arsenical carbamate) which exerts a strong fungicidal action on apple scab [*Venturia inaequalis*] and imparts a brilliant colour to the fruit. It was phytotoxic at the high concentrations (0·125 to 0·1 per cent.) used in the first experiments in 1953, but this drawback was overcome without loss of efficiency by reducing the post-blossom sprays to 0·1 to 0·075 and 0·05 per cent. Tuzet also gave good results when applied as a 'mist' in 1955. It is compatible with the standard insecticides but not with lead arsenate or other arsenical compounds. Tuzet may also be applied to pears but not to stone fruits, peach being particularly sensitive.

Besemer (A. F. H.). **Ontwikkelingen op het gebied van de ziektenbestrijdingsmiddelen.** [Developments in the field of disease control preparations.]—*Meded. Dir. Tuinb.*, 18, 8–9, pp. 646–657, 1955. [English summary.]

Most of the information concerning fungicides in the author's useful survey of

recent developments in plant protectives has already appeared in this *Review*, but mention may be made of tritrizol as an alternative name for bulbosan [*R.A.M.*, 31, p. 26], a specific remedy against *Cladosporium cucumerinum* on cucumber, *C. fulvum* on tomato, and other pathogens.

MARTIN (H.). **Fungicides past, present and future. The mode of action of fungicides.** —*Plant Dis. Reptr*, 39, 7, pp. 561–566, 1955. [Multilithed.]

In this contribution to a symposium on fungicides the author reviews the development of research on the mode of action of fungicides, and points out that studies of the effect of a chemical on the fungal pathogen are being extended to cover its action on the host-pathogen complex. This trend may have a profound influence on future investigations of fungicidal activity.

FONT (A.). **Les propriétés fongicides de l'oxyde cuivreux en émulsion huileuse.** [The fungicidal properties of copper oxide in oil emulsion.]—*Phytiatrie-Phytopharm.*, 4, 3, pp. 147–155, 1955.

The author outlines the preparation and physical properties of copper oxide in oil emulsion and quotes examples from a number of countries of its efficacy as a fungicide on various crops. In a test of its persistence on vine leaves the copper deposit, measured two weeks after spraying and after heavy rain, was almost twice that from Bordeaux mixture, though the copper content of the emulsion was only half that of Bordeaux. Good persistence was also recorded in tests against potato blight [*Phytophthora infestans*] in France [*R.A.M.*, 35, p. 120], cercosporiosis [*Cercospora beticola*] on beet in Italy, *Hemileia vastatrix* on coffee in the Belgian Congo, and *Cercospora musae* [*Mycosphaerella musicola*] on banana in the French Antilles [34, p. 658], and when the preparation was used as a winter treatment for fruit trees.

DARPOUX (H.). **Les nouveaux fongicides dans la lutte contre certaines maladies des plantes.** [New fungicides in the control of certain plant diseases.]—*Centre Perfect. tech.* 3202, 20 pp., 2 graphs, 1954.

In the first part of this paper, based on the literature (23 titles), the author discusses the efficacy of the newer organic fungicides applied externally to control scab of apples and pears [*Venturia inaequalis* and *V. pirina*], [downy] mildew of vine and potato [*Plasmopara viticola* and *Phytophthora infestans*], and rusts [*Puccinia* spp.] of cereals and ornamentals; he also discusses the use of antibiotics against powdery mildews of various crops. The second part is devoted to chemotherapy, with references to 47 titles.

SAMPSON (R. E.) & LUDWIG (R. A.). **Laboratory studies on the evaluation and activity of antifungal fumigants.**—*Canad. J. Bot.*, 34, 1, pp. 37–43, 4 graphs, 1956.

At the Science Service Laboratory, London, Ontario, a method was evolved for evaluating antifungal fumigants using ethylene oxide, soluble in water, and chloropicrin, which was insoluble, against the test organisms *Alternaria solani*, *Fusarium oxysporum* f. *lycopersici* [*F. bulbigenum* var. *lycopersici*] and *Bacillus subtilis*. Spores of *A. solani* were deposited on sintered glass disks or filter paper, vacuum dried, and exposed to the fumigant. Germination was induced by placing the spores in contact with 0·05 per cent. orange juice overnight; the germ-tubes were stained in methylene blue before counting. Dosage-response curves were constructed at three relative humidities.

Thread cultures of *F. bulbigenum* var. *lycopersici* and *B. subtilis* were prepared, using Forsberg's method [*R.A.M.*, 28, p. 400], and exposed to the fumigants after drying, then plated out on potato dextrose agar and nutrient agar, respectively.

Results were evaluated by counting the threads from which no growth appeared after incubation [cf. 33, p. 355].

Ethylene oxide and chloropicrin were more effective against the test organisms at high levels of relative humidity [cf. 32, p. 579], possibly due to a resulting higher rate of metabolism. The fact that the dosage response curve for ethylene oxide with *A. solani* was steep at zero relative humidity and flat at 100 per cent., and the reverse with chloropicrin, is at present inexplicable.

STUBBS (J.). **Greenhouse methods of evaluating foliage fungicides.**—*C.R.* (*III*[e]) *Congr. int. Phytopharm., Paris, 1952*, 2, pp. 79–84, 2 figs., 1 graph, [? 1953. Received 1955.]

Details are given of a technique developed at the Hawthorndale Laboratories of Imperial Chemical Industries Ltd., Bracknell, Berkshire, for evaluating foliage fungicides, using *Alternaria solani* on the tomato variety Best of All [*R.A.M.*, 32, p. 492]. The chemical to be tested was sprayed by means of an aerograph, type CH, touch-up gun on to test plants mounted on a turn-table under a spray hood. In preliminary tests it was shown that adequate foliage cover was given with a standard minimum wetting formulation by spraying for 30 secs. under specified conditions. When the spray deposit had dried overnight the test plants were inoculated by atomising an aqueous spore suspension of 30,000 spores per ml. on to the lower leaf surfaces, the plants then being held at high humidity for 24 hours. Lesion counts were subsequently made on five leaflets of each of the lower five leaves of the test plants. Chemicals were tested as formulations containing 0·05 per cent. active ingredient and compared with a standard TMTD [thiram] formulation also at 0·5, which gave 95 per cent. control under the test conditions. The fixed copper fungicides showed the least activity against *A. solani*, the majority of the non-mercurial organics being somewhat more effective, but less active than the organo-mercurials. It is emphasized that these fungicides are not efficient unless formulated to comply with certain minimum specifications and that these tests do not take weathering into account, which would affect performance in the field, the final criterion.

MILLER (L. P.), MCCALLAN (S. E. A.), & WEED (R. M.). **The use of radioisotopes in studying the affinity of various toxicants for fungus spores.**—*Radioisotope Conf.*, 1 (*1954*), pp. 381–390, 1 graph, [? 1955].

The toxicity of fungicidal materials is commonly expressed in terms of the concentration of the applied solution. This can, however, be misleading, as many spores adsorb the fungicide from solution and this adsorption may occur to a greater or lesser extent according to the particular spores and fungicide in question.

The authors describe a method used at the Boyce Thompson Institute, New York [*R.A.M.*, 33, p. 437], to study radioactively labelled fungicides. A known weight of spores is suspended in a known solution of fungicide for a given time and then removed by centrifuging. Measurement of the loss of radioactivity from the supernatant solution indicates the uptake of fungicide by the spores.

Among the fungicides used were sulphur S^{35}, silver Ag^{110}, cerium Ce^{144}, mercury Hg^{203}, ferbam labelled with S^{35}, and 2-heptadecyl-2-imidazoline and dichlone both labelled with carbon C^{14}. The spores included those of *Monilia* [*Sclerotinia*] *fructicola*, *Venturia inaequalis*, *V. pirina*, *Aspergillus niger*, *Alternaria oleracea* [*A. brassicicola*], *Glomerella cingulata*, and *Cephalosporium acremonium* [34, p. 534]. Following silver, dichlone was the most toxic of the compounds studied.

If spores which had absorbed radioactive fungicide were exposed to high concentrations of non-radioactive fungicide some exchange took place. By studying the rate of exchange it was possible to gain an idea of the strength with which the fungicides were held by the spores.

RANKIN (W. B.). **Fungicides and the Miller pesticides chemicals law.**—*Agric. Chemic.*, 11, 2, pp. 37, 101–102, 1956.

Under the Miller pesticide chemicals amendment to the Food, Drug, and Cosmetic Act of the United States of America, which becomes fully effective for fungicides in July, 1956, the latter fall into four classes. The first includes chemicals not considered poisonous (such as sulphur and lime-sulphur); the second, those which, though poisonous, leave residues presenting no danger (most of the common copper compounds, if applied before harvest, fall into this category); the third covers poisonous products safe enough in small residues, the tolerances for which are set for specific crops; they include captan, ferbam, maneb, zineb, ziram, and nabam; those in the fourth group have a zero tolerance and must be used under proper conditions leaving no residue. Mercury-containing compounds are in this group, and also at present such substances as antibiotics, formaldehyde, spergon and thiram, for which no degree of tolerance has yet been established. Growers should use proprietary fungicides only in accordance with the accompanying instructions.

BRANDES (G. A.). **Industry's part in meeting our fungicide requirements.**—*Agric. Chemic.*, 11, 3, pp. 42–45, 137, 139, 141, 1956.

In this informative account of the problems and expenditure involved in the production of modern fungicides [*R.A.M.*, 33, p. 364; 35, p. 204] in America and their ultimate distribution to the farmer the writer reviews the commercial development of the organic fungicides which have largely replaced the inorganic sulphurs and coppers in the last 20 years; they are in general more specific for certain diseases and less phytotoxic, and have a greater efficiency and ease of preparation which more than compensate for higher costs. The earliest fungicides of this type were the bisdithiocarbamates and thiocarbamates, organic sulphur compounds five to six times more effective per unit than elemental sulphur. They include dithane D-14 (nabam) and dithane Z-78 (zineb) ,which have now largely replaced Bordeaux mixture in the control of potato late blight [*Phytophthora infestans*], and ferbam, now used to control apple scab [*Venturia inaequalis*]. Likewise the phenyl mercury fungicides, such as crag and captan, have become increasingly popular. Karathane is considered 20 times as effective as sulphur (per unit of active ingredient) for the control of powdery mildews, and the organic seed treatments (arasan, spergon, phygon, etc.) are more effective and safer than the inorganics formerly used.

The writer refers to the large amount of experimentation involved in testing new fungicides, the more so now that they have to conform in the United States to the Miller Bill [see preceding abstract], and to the need for fundamental and co-operative research.

ABIUSSO (N. G.). **Compuestos del azufre : su comportamiento respecto a los hongos fitopatogenos.** [Sulphur compounds: their action with regard to phytopathogenic fungi.]—*Rev. Invest. agríc., B. Aires*, 6, 1, pp. 131–156, 1952. [Received February, 1956.]

In an investigation of various sulphur compounds [*R.A.M.*, 33, p. 491] the minimum effective dose for toxicity to spores of *Fusarium vasinfectum*, *Colletotrichum* [*Glomerella*] *glycines*, and *Gloeosporium cyclaminis* was 1 in 800,000 for tetramethyl thiuram disulphide [thiram] and also for ferric dimethyl dithiocarbamate [ferbam] against spores of the two latter and of *Cephalothecium roseum*. Disodium ethylene bisdithiocarbamate [nabam] was effective at a minimum dose of 1 in 200,000 against the first three fungi; a 2 per cent. solution of this compound maintained its toxicity for 20 days.

Helicopter spraying.—*Agric. Engng, St. Joseph, Mich.*, 37, 1, p. 29, 2 figs., 1956.

In this brief note on the uses of a helicopter for spraying by small-acreage tobacco

farmers, a record of 425 acres covered in one day by a Bell machine is instanced from North Carolina. The helicopter has a 75-gal. spray capacity and is well adapted for the treatment of small, tree-lined plots which cannot be easily reached from fixed-wing aircraft at tree-top height. Speeds range from 0 to 90 miles per hour in any direction; the spray can be applied 1 ft. above the crop and the strong rotor blade downwash is reported to force the chemical through the foliage to the ground, where it swirls upwards to cover the lower surfaces of the leaves. The machine is kept in use most of the year as it can be used also for cabbage, potato, and cotton crops.

Akesson (N. B.) & Sciaroni (R. H.). **New air powered hand duster.**—*Calif. Agric.*, 10, 3, pp. 3–4, 16, 3 figs., 2 graphs, 1956.

A hand duster is described of a type useful for application of fungicides to ornamental plants grown under glass. Two sizes, one gal. and two, have been made from milk pails of well-tinned sheet metal; the range of the duster depends on the hose length to the air supply, permanent air lines being necessary. A 7,000 sq. ft. greenhouse can be dusted in about 20 minutes, as compared to over an hour for liquid spray application. The duster uses a fluidizing principle [described in detail] to control dust discharge. Wettable powders of captan and zineb were applied to carnations with no harmful effects, the total application of chemical per unit area being the same as that in a water spray.

Zelle (M. R.). **Genetics of microorganisms.**—*Annu. Rev. Microbiol.*, 9, pp. 45–96, 1955.

With 475 references to the literature published in 1954, the author succinctly reviews and discusses the present state of knowledge concerning the genetics of micro-organisms [*R.A.M.*, 25, p. 351; 29, p. 298] under the main headings: phenogenetics; cytoplasmic factors and effects; transmission genetics, including a section on fungi; nature and properties of the genetic material; and methods.

Eide (C. J.). **Fungus infection of plants.**—*Annu. Rev. Microbiol.*, 9, pp. 297–318, 1955.

The author reviews and discusses with 84 references to the literature the present state of knowledge concerning the physiology of host-parasite relations in the fungal infection of plants [*R.A.M.*, 25, p. 173]. The subject is dealt with under the headings: the stimuli to penetration; factors affecting penetration and infection; penetration of plants through wounds; infection processes after penetration; and infection and disease control.

Burnett (J. H.). **The mating systems of fungi. I.**—*New Phytol.*, 55, 1, pp. 50–90, 1956.

In the first part of this paper, following a discussion of the confusion existing in the terminology of fungus mating systems [*R.A.M.*, 29, p. 224; 31, p. 617], the author proposes a new terminology. Heteromixis is used to signify the condition where sexual reproduction results from the fusion of genetically different nuclei derived from different thalli, and includes dimixis where there are only two types of complementary nuclei controlling mating, the nuclear types being determined by two allelomorphs at a single locus, and diaphoromixis where several types of complementary nuclei control it and are determined by multiple allelomorphs at one or two loci. A third heteromictic condition is homo-heteromixis where genetically different nuclei derived from the same thallus fuse during sexual reproduction. Homomixis denotes the fusion of genetically similar nuclei from the same thallus. In amixis the essentials of sexual reproduction are lacking but preconjugation and

post-meiotic events may occur. A comparison of these terms with pre-existing ones is tabulated, with examples of fungi possessing each type of mating system.

The control and operation of the different types of mating systems are discussed, and it is suggested that the factors controlling compatibility are pleiotropic in their effects, indicating that mating-type factors may be groups of closely linked genes. It is concluded that mating systems have evolved in a number of different ways and that, in the first instance, selection of potential mating-type factors may not have been for their effects upon compatibility.

Moreau (C.). **Les maladies parasitaires des principales cultures coloniales. Revue bibliographique. XIII. XIV. XV.** [The parasitic diseases of the principal colonial crops. A bibliographical review. XIII. XIV. XV.]—*Rev. Mycol.*, 19, *Suppl. colon.* 1, pp. 28–43; 2, pp. 73–91, 1954; 20, 1, pp. 63–72, 1955.

Further notes are given on the principal diseases of colonial crops [cf. *R.A.M.*, 34, p. 164], based on world literature published from 1951 to 1954 (312 titles in all).

Lodhi (S. A.) & Naeem (A.). **Some seed-borne fungi from Pakistan.**—*Trans. Brit. mycol. Soc.*, 38, 3, pp. 240–242, 1955.

In this contribution from the Department of Botany, University of the Punjab, Lahore, Pakistan, the authors list 18 species of fungi isolated during 1953–4 by the plating method [*R.A.M.*, 20, p. 261] from seeds, mostly of economic plants, collected in the neighbourhood. Among the more important fungi were *Melanospora zamiae* and *Gymnoascus bourquelotii* from cotton, *Nigrospora sphaerica* from *Helichrysum* sp., and *Helminthosporium sativum* [*Cochliobolus sativus*] from *Bombax malabaricum*.

Pady (S. M.) & Kapica (L.). **Fungi in air masses over Montreal during 1950 and 1951.**—*Canad. J. Bot.*, 34, 1, pp. 1–15, 1956.

Further information is presented on 40,359 isolates from the air trapped in Montreal from September, 1950, to December, 1951 [*R.A.M.*, 34, pp. 165, 799]. The most common fungi were *Cladosporium* (47·7 per cent.), *Penicillium* (15·8), yeasts (10·4), *Aspergillus* (4·6), *Alternaria* (4·2), and actinomycetes (2·2). In addition *Pullularia*, *Oospora*, *Fusarium*, *Stemphylium*, *Verticillium*, *Rhizopus*, *Spicaria*, *Scopulariopsis*, *Phoma*, *Mucor*, *Botrytis*, *Cephalosporium*, *Trichoderma*, *Helminthosporium*, *Neurospora*, *Papularia*, *Cephalothecium*, *Pyrenochaeta*, *Zythia*, and *Nigrospora* were frequently found.

Spore numbers exhibited seasonal fluctuations, averaging 244 per cu. ft. in July to 0·8 per cu. ft. in December. The maximum reading obtained was 445 on 6th September, 1951. Fungi in the air over Montreal are believed to originate in agricultural areas.

Freeman (G. H.). **Spread of diseases in a rectangular plantation with vacancies.**—*Biometrika*, 40, 3–4, pp. 287–296, 1953. [Received 1955.]

The spread of diseases from plant to plant in a rectangular plantation where there may be some missing plants is considered mathematically from two aspects. The first, or spatial, method is concerned with the degree of agglomeration of diseased plants at any one time; the second, or temporal, method deals with the spread of a disease over a period of time. For the former, formulae are given for the modification of existing methods (*Biometrika*, 36, pp. 135–141, 1949) to allow for vacancies; for the latter the 2 by 2 comparative trial method (ibid., 34, pp. 123–138, 1947) is employed. Both methods were applied to the data on spread of hop nettlehead virus as given by Legg [*R.A.M.*, 33, p. 259]. The author concludes that the two methods supplement each other and, in general, both must be used before it can be concluded that the apparent spread corresponds to a spread of inoculum.

Trotter (A.). **La patologia vegetale nel quadro della patologia comparata.** [Plant pathology within the framework of comparative pathology.]—*Scientia, Bologna*, Ser. VI, 91, 1, pp. 29–35, 1956.

The history of phytopathology (or 'phytoatry' as it should preferably be termed) is traced from earliest times to the present day, with special emphasis on its relations to human and animal pathology.

Lawrence (C. H.). **A method of isolating actinomycetes from scabby Potato tissue and soil with minimal contamination.**—*Canad. J. Bot.*, 34, 1, pp. 44–47, 1 pl., 1956.

At the Plant Pathology Laboratory, Fredericton, New Brunswick, it was found that actinomycetes were more easily isolated [*R.A.M.*, 30, p. 382] if the soil or potato tubers with scab [*Actinomyces scabies*] from which they were to be obtained were first treated for ten minutes in 1 in 140 phenol [cf. 35, p. 312]. This eliminated fungal contaminants of the spreading type and most bacteria. Higher concentrations decreased the number of actinomycetes; at twice the strength it prevented growth entirely. Maximum number and optimum development of actinomycetes were obtained on media adjusted to pH 6·5. Isolates from soil grew best on Czapek's agar, while those from potato preferred a glucose-asparagine medium.

Rotman (B.). **A simplified device for continuous growth of microorganisms.**—*J. Bact.*, 70, 4, pp. 485–486, 1 diag., 1955. [Received April, 1956.]

At the Institute for Enzyme Research and the Department of Genetics, University of Wisconsin, Madison, the author devised a modification of Novick and Szilard's chemostat (*Cold Spr. Harb. Symp. quant. Biol.*, 16, p. 337, 1951) for obtaining micro-organisms grown under identical chemical and physical conditions, based on the delivery of nutrient solution at a constant rate into a constant volume of culture. The apparatus has been used for five months with flow rates ranging from 0·7 to 15 ml. per hour.

Bukovski (T.). **Technika zbioru zarodników grzybów kapeluszowych przeznaczonych do kiełkowania.** [Technique for collecting spores of cap fungi for germination purposes.]—*Acta microbiol. polon.*, 3, 4, pp. 399–401, 1954. [Russian and English summaries.]

At the Mycological Laboratory, Warsaw, Poland, spores of *Agaricus hortensis* [*A. bisporus*] were collected on a dish placed under the sporophore growing on its natural substrate or removed from the bed together with spawn and earth and grown in a sterilized tube containing water. Under such conditions basidia continued to develop and there was 100 per cent. germination of spores after five hours.

Wright (Joyce M.). **The production of antibiotics in soil. II. Production of griseofulvin by Penicillium nigricans.**—*Ann. appl. Biol.*, 43, 2, pp. 288–296, 1955.

In further work at the Akers Research Laboratories, Welwyn, Herts, on the production of antibiotics in soil [*R.A.M.*, 34, p. 168] a study was made of the production of griseofulvin by *Penicillium nigricans* in an acid, sandy podsoil from Wareham Heath and a garden soil. In both there were two essential prerequisites for optimum production: sterilization, and enrichment with organic matter. Garden soil provided the better medium, though the Wareham soil was improved in this respect by liming. The yield of griseofulvin was reduced in soil reinfected by other soil organisms, particularly by some known to produce anti-fungal antibiotics, e.g. *P. expansum*, *P. frequentans*, and two strains of *Trichoderma viride*. Other fungi, believed not to produce anti-fungal substances, also had an antagonistic effect, being mostly those with a characteristically rapid growth-rate, e.g., *Mucor ramannianus* and one strain of *T. viride*. Sometimes *P.*

nigricans was itself antagonistic to other fungi, irrespective of their ability to produce antibiotics or of their fast-growing habit.

A higher level of nutrient was required for the production of griseofulvin than for that (in the earlier work) of gliotoxin by *T. viride* [34, p. 168]; also, the effect of antagonism by other soil organisms was more important than in the production of gliotoxin.

Vörös (J.). **A trichothecin antibiotikum alkalmazása növényi kórokozók ellen.** [Application of the antibiotic trichothecin against plant diseases.]—*Növénytermelés*, 4, 3, pp. 233–240, 2 figs., 2 graphs, 1955. [Russian and English summaries.]

In studies at the Research Institute for Plant Protection, Budapest, Hungary, trichothecin [cf. *R.A.M.*, 33, p. 532 and below, p. 498] was produced in cultures of *Trichothecium roseum*. Commercial and starch sugars were found to be better than pure glucose for the production of the antibiotic and shaking with 10 to 20 per cent. chloroform the best method of extracting it. Distillery returns of maize stimulated antibiotic production. Trichothecin at 1 unit per ml. inhibited the growth *in vitro* of the melon rot fungus, *Colletotrichum lagenarium* [11, p. 619], and at concentrations of up to 50 units per ml. stimulated the germination of melon seed. Sprays containing less than 100 units per ml. of the antibiotic were harmless to the seedlings. Spraying flowers of sour cherry with 50 units per ml. kept cherries free from infection by *Monilia* [*Sclerotinia*] *laxa* [12, p. 640]. Similarly, trichothecin was effective against wheat bunt (*Tilletia foetida*) [34, p. 30]. Soaking Bánkúti 1201 wheat seeds in concentrations up to 100 units per ml. for 15 minutes stimulated germination, while treatment with 1,000 units per ml. reduced bunt from 5·6 per cent. (control) to 0·008 per cent. in small trial plots.

Cercós (A. P.). **Streptomyces rutgersensis var. castelarense n. var.; nuevas propiedades de la canfomycin.** [*Streptomyces rutgersensis* var. *castelarense* n.var.; new properties of canfomycin.]—*Rev. Invest. agríc., B. Aires*, 8, 3, pp. 263–283, 7 figs., 1954.

The organism previously found to produce the antibiotic canfomycin (*Rev. argent. Agron.*, 20, 2, pp. 53–62, 1953) is identified as *Streptomyces* (*Actinomyces*) *rutgersensis* var. *castelarense* n.var. The antibiotic substance has two components, one lytic and the other inhibitory to growth. Organisms affected include *Helminthosporium sativum* [*Cochliobolus sativus*, *Neurospora crassa*, and *Xanthomonas campestris*.

Wagner (F.). **Methoden des Einsatzes von Antibiotiken und antibiotischen Wirkstoffen im Pflanzenschutz.** [Methods for the application of antibiotics and antibiotic materials in plant protection.] —*Pflanzenschutz*, 7, 9, pp. 124–128, 3 figs., 1955.

The author's survey of various methods for the application of antibiotics in plant protection [*R.A.M.*, 34, p. 49 and next abstract] is based on 21 contributions to the literature on the subject, most of which have already been noticed in this *Review*.

Dekker (J.). **Antibiotica bij de bestrijding van plantenziekten.** [Antibiotics in the control of plant diseases.]—*Meded. Dir. Tuinb.*, 18, 8–9, pp. 623–638, 3 figs., 1955. [English summary.]

Information based on 70 contributions to the literature is presented on the function of antibiotics in plant disease control [see preceding abstract], especially by means of internal seed disinfection. In tests at the Laboratory for Phytopathology, Wageningen, Holland, the incidence of infection by *Ascochyta pisi* in Dopper Eminent peas [*R.A.M.*, 34, p. 271] was reduced from 40 to 1·5 per cent. by seed treatment with a slurry of rimocidin.

Strzemska (Mme J.). **Zagadnienie mykorizy u zbóż. Cz. IV. Jęczmień.** [The problem of mycorrhiza in cereals. Part IV. Barley.]—*Acta microbiol. polonica*, 4, 3, pp. 183–189, 7 figs., 1955. [Russian and English summaries.]

In further studies in this series [cf. *R.A.M.*, 34, p. 666] endotrophic mycorrhiza were found in all the 228 root preparations from barley grown in a variety of soils, with pH ranges from 4·5 to 8, development being independent of soil type and pH. The barley mycorrhizal fungus, gaining entrance through the root-hairs or other epidermal cells, is similar to that of rye and wheat [see next abstract]. Barley roots, however, are more often infected than those of other cereals, but the intensity of mycelial growth is much lower than in wheat and oats.

Strzemska (Mme J.). **Wyniki badań nad mykorizą u zbóż.** [The results of studies on mycorrhiza in cereals.]—*Acta microbiol. polonica*, 4, 3, pp. 191–204, 4 pl., 1955. [Russian and English summaries.]

Much of this information on mycorrhizal development in cereal crops in Poland has already been noticed [see preceding abstract]. Mycorrhiza appear to be least abundant in roots of rye.

Pryor (L. D.). **Ectotrophic mycorrhiza in renantherous species of Eucalyptus.**—*Nature, Lond.*, 177, 4508, pp. 587–588, 1 fig., 1956.

Records show that introductions into non-native areas of the group Renantherae of *Eucalyptus* often suffer striking failures. For example, in the forest nursery at Eski Kellek, Iraq, in 1953 some eucalypts were growing easily and were healthy and vigorous, but species of the Renantherae raised under comparable conditions were weak and chlorotic and most of them died. Similar symptoms were induced in the same species at Canberra, Australia, by growing them in heat-sterilized soil. These observations suggested that mycorrhiza might be necessary. Consequently, *E. dives*, *E. pauciflora*, and *E. macrorrhyncha* of the Renantherae were grown in pots inoculated with spores of *Scleroderma flavidum* [cf. *R.A.M.*, 32, p. 496], often found in close association with *E. pauciflora* and *E. robertsonii* in experimental plantings near Canberra, also in comparison with *E. bicostata* of a different group, and with plants of all four species raised in uninoculated, sterilized soil. The spores were added ½ in. below the final surface so that the growing roots had to pass through the spore layer.

After four months good growth and colour in the Renantherae were accompanied by mycorrhizal development where spores had been added, whereas *E. bicostata* grew equally well with or without them and produced no mycorrhiza. The roots of *E. macrorrhyncha* bore a thick, dense hyphal mantle outside the epidermis with a distinct Hartig net penetrating to a depth of two or three cortical cells. It appears, therefore, that the indifferent growth of many species of the Renantherae in the northern hemisphere may be corrected by inoculation with the appropriate fungus.

Doak (K. D.). **Mineral nutrition and mycorrhizal association of Bur Oak.**—*Lloydia*, 18, 3, pp. 101–108, 3 figs., 1955.

Seedlings of bur oak (*Quercus macrocarpa*) were grown at Crown Point, Indiana, in sand cultures lacking the natural ectotrophic mycorrhizal association in order to observe the effect of major deficiencies. Nitrogen deficiency caused a yellowish-green colour and slight growth reduction, phosphorus deficiency a growth reduction and a reddish-deep green colour, particularly near the veins, and potassium deficiency a complete interveinal chlorosis near the leaf margin.

Development of mycorrhiza was inhibited in humus from the forest site where the seeds were procured by the addition of a complete mineral nutrient, though there was little difference in growth and leaf colour between these and humus

cultures without mineral nutrient but developing mycorrhiza. Mycorrhizal structure in the humus cultures was somewhat different from that formed under natural conditions, the latter having in addition a compound form with a common mantle.

Levisohn (Ida). **Growth stimulation of forest tree seedlings by the activity of free-living mycorrhizal mycelia.**—*Forestry*, 29, 1, pp. 53–59, 2 pl., 1956.

In a field experiment at Wareham Heath in 1945 the late Dr. M. C. Rayner noted, in previously unpublished observations, that Sitka spruce seedlings were stimulated by the external activity of *Rhizopogon luteolus* [cf. *R.A.M.*, 32, p. 637] mycelium prior to the actual invasion of the root tissues. Further pot-culture experiments [loc. cit.], using poor heathland soil from the Wareham area [32, p. 108] free from ectotrophic and endotrophic mycorrhizal fungi (with the exception of *Boletus bovinus*), demonstrated that the soil activity of mycorrhizal fungi in inoculated pots improved the growth of spruce, pine, and birch seedlings.

In another series endotrophic tree species, such as ash, *Chamaecyparis lawsoniana* [34, p. 169], and *Robinia pseudo-acacia*, were stimulated by ectotrophic mycorrhiza-formers, particularly *B. scaber* [34, p. 803] and *Rhizopogon luteolus*, though there was no subsequent penetration. It is suggested that the action of these fungi depends on their ability to break down organic matter into nutrients available to the seedlings.

Stokstad (E. L. R.), Broquist (H. P.), & Sloane (N. H.). **Nutrition of micro-organisms.**—*Annu. Rev. Microbiol.*, 9, pp. 111–144, 1955.

The authors review the literature published from 1951 to 1955 (202 references) on the nutrition of micro-organisms.

Tandon (R. N.) & Agarwala (R. K.). **Nutritional studies of three species of Gloeosporium. I. Effect of different sources of carbon and some of their mixtures.**—*Proc. Indian Acad. Sci.*, Sect. B, 43, 1, pp. 1–8, 1956.

At the University of Allahabad the authors isolated *Gloeosporium psidii* [*Glomerella cingulata*] from guava [*R.A.M.*, 34, p. 735], *Gloeosporium limetticola* [C.M.I. map No. 119] from lime, and *G. citricola* from citron and compared their growth with different carbon sources. Of the 19 used, mannitol, galactose, raffinose, and sorbitol gave good growth of all three species. *Glomerella cingulata* and *Gloeosporium limetticola* grew better on any combination of galactose, raffinose and sorbitol, but *G. citricola* used them singly better than in mixture and grew best on mannitol, which also gave excellent growth of *Glomerella cingulata* when mixed with raffinose. Very good sporulation of *G. cingulata* was obtained on a combination of all four sources, *Gloeosporium citricola* sporulated best on a mixture of raffinose and galactose or of sorbitol and galactose, and *G. limetticola* on raffinose alone.

Sabet (K. A.). **I. Methods for demonstrating the pectolytic action of phytopathogenic bacteria. II. Action of some rot fungi on pectate gel.**—*Bull. Fac. Agric. Egypt. Univ.* 14, 34 pp., 1952. [Arabic summary. Received 1955.]

The first part of this paper deals with investigations of the action of bacterial enzyme extracts on parenchyma tissue from carrots, carried out at the Department of Agricultural Botany, Fouad I University, Cairo. The liquefaction of pectate gel is considered to be a criterion on which to distinguish pathogenic from non-pathogenic organisms in isolations from diseased plant material [*R.A.M.*, 31, p. 8]. Plant pathogens of the genera *Pseudomonas*, '*Bacterium*' [chiefly species of *Erwinia*], and *Bacillus polymyxa* produce characteristically different types of liquefaction. The liquefaction produced by *Pseudomonas* species is shallow and tends to set again. A light, semi-transparent liquid, about 2 cm. deep, is produced by soft rot species of *Bacterium*, while *Bacillus polymyxa* completely liquefies the

medium. *Xanthomonas* species produce moderate liquefaction and a neutral reaction; *Corynebacterium* gives slight alkalinity with moderate liquefaction. Saprophytes are unable to liquefy the medium.

In the second part the use of pectate gel for demonstrating the pectolytic action of rot fungi is discussed. *Pythium* sp. and *Alternaria solani* were more active on neutral or slightly alkaline pectate gel media, while *Penicillium digitatum*, *P. italicum*, *Aspergillus* sp., *A. niger*, *Botrytis allii*, and *Rhizopus nigricans* [*R. stolonifer*] were more active on an acid one.

CHOUDHURI (H. C.). **Storage tests for the control of diseases and insect pests.** *Amer. Potato J.*, 33, 1, pp. 6–14, 3 graphs, 1956.

The writer describes trials with various chemicals in an endeavour to prevent losses in stored potatoes due to pests and diseases under the conditions prevailing in West Bengal, namely absence of refrigeration and a temperature range of 80° to 96° F. It was found that treatment of tubers before storage with gammexane D.034 (containing 4 per cent. BHC and 0·5 per cent. gammexane BHC) and geigy-33A (containing 10 per cent. DDT) at 0·6 oz. per 82 lb. of tubers significantly controlled storage loss due to decay (principally by *Fusarium caeruleum*).

BASILE (RITA). **Diagnosi precoce di virosi in alcune varietà di Patate italiane.** [The early diagnosis of virus diseases in some Italian Potato varieties.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 12 (*1954*), pp. 213–219, 1955. [English summary.]

In tuber-indexing and serological diagnosis carried out at the Centre of Studies on the Potato, Rome, the Bianca and Quarantina potato varieties displayed appreciable resistance to potato viruses X and XY [X+Y].

WILSON (J. H.). **Effects of nutrition and light intensity on symptoms of leaf-roll virus infection in the Potato plant.**—*Ann. appl. Biol.*, 43, 2, pp. 273–287, 23 graphs, 1955.

In this further account of studies conducted at Rothamsted Experimental Station in 1949 and 1950 on the effect of nutrition and shading on the expression of leaf roll virus in potatoes [*R.A.M.*, 31, p. 200] it is stated that increasing the nitrogen supply reduced the intensity of leaf symptoms and caused a smaller and less consistent reduction in phloem necrosis. The application of a phosphatic fertilizer reduced leaf symptoms at first, but later increased them, while it increased phloem necrosis at all stages of growth. When the light intensity was approximately halved, leaf symptoms were reduced, but there was no effect on phloem necrosis. The masking of leaf symptoms by nitrogen and by phosphorus in the early stages of growth was closely correlated with the increases in the relative rates of leaf growth produced by these substances.

As the evidence showed that leaf rolling and phloem necrosis can be affected differently by the same factor, and that each may be present in the absence of the other, it is concluded that they are not causally related, but are independently determined expressions of infection.

Proceedings of the second conference on Potato virus diseases, Lisse-Wageningen, 25–29 June, 1954.—193 pp., 49 figs., 18 graphs, 18 diags., Wageningen, H. Veenman & Zonen, 1955.

At the second International Conference on potato viruses diseases in Holland [cf. *R.A.M.*, 32, p. 144] an introductory address was given by the late R. N. SALAMAN (pp. 14–25) who outlined the experiences of himself and others over the previous half century and the history of potato research at Cambridge.

Serological investigations and other diagnostic methods employed in the study of potato virus X at the State Phytopathological Research Station, Lyngby,

Denmark, were outlined by H. R. KRISTENSEN (pp. 26–29). When freshly harvested tubers infected with virus X were cut and rubbed on the leaves of the indicator *Gomphrena globosa* [see below, p. 482] satisfactory positive results were obtained, but similar tests made in winter were not reliable.

R. BARTELS, Brunswick, Germany (pp. 30–33), dealt with the behaviour of potato virus A in tobacco plants, with special reference to the diminution of its activity. The concentration of the virus in the tobacco variety Samsun, studied serologically for 21 weeks after inoculation, was found to depend on the season of the year as well as the age of the host plant. A maximum concentration was reached in six weeks, after which it diminished in the older leaves; during flowering it was undetectable serologically in the green leaves. A relationship between flowering and virus inhibition is suggested. This behaviour was not, however, observed in White Burley tobacco, in which the virus remained active.

The preparation of antisera against potato virus S [see below, p. 536 and next abstract], with special reference to the preparation from extracts of infected potato plants of non-toxic virus suspensions for the immunization of rabbits was described by D. H. M. VAN SLOGTEREN, Lisse, Holland (pp. 35–39). Much of this information has already been noticed from another source [35, p. 273]. Serological diagnosis was regarded as the only efficient method of identifying the presence of potato virus S.

J. A. VAN DER VEKEN, Lisse, Holland (pp. 40–42), gave details of a freeze-drying method for the isolation and preservation of plant virus antibodies in fractions obtained after absorption of antisera by extracts from healthy plants.

Experiments on the serological diagnosis of the potato leaf roll virus, hitherto not possible with potato sap, were outlined by A. B. R. BEEMSTER, Wageningen (pp. 43–44). *Physalis floridana* was used for the preparation of serum three to four weeks after inoculation with potato leaf roll virus by *Myzus persicae* [cf. 32, p. 499]. Some positive reaction was obtained using sap diluted with 0·9 per cent. saline solution, suggesting that a serological diagnosis of the leaf roll virus in *P. floridana* is practicable.

D. H. M. VAN SLOGTEREN (pp. 45–50) described the serological analysis of some plant viruses by the gel-diffusion method (*Proc. Soc. exp. Biol., N.Y.*, 79, pp. 319–324, 1952). Except for tobacco mosaic virus the plant viruses which diffused into agar were all of the type with small, spherical particles. It is considered that the method may be applied when complexes of antigens have been formed, either due to the presence of several viruses in the same host or to antigenic multiplicity of hosts infected with a single virus.

The same author (pp. 51–54) described a micro-method for serological reactions of plant viruses under paraffin oil, applicable when a large number of plants require testing and there is a shortage of the necessary antiserum. Small drops of diluted antiserum are placed on a film of polyvinyl formal on the bottom of a Petri dish and mixed with droplets of clarified antigen suspensions. Paraffin oil is poured gently from the side to flow over the drops, which remain in position and are prevented from drying out. Reactions are observed by means of a dark-field microscope or a stereomicroscope with side illumination against a dark background. The same technique can be used for micro-agglutination reactions [*R.A.M.*, 34, p. 132].

H. J. DE FLUITER, H. H. EVENHUIS, and F. A. VAN DER MEER, Wageningen (pp. 84–88), contributed observations on some leafhopper-borne virus diseases in Holland. Until recently the only known ones in Europe occurred in Russia, including oat mosaic (zakuklivanie) and wheat mosaic [34, p. 278]. Since 1945 *Rubus* stunt virus [see above, p. 467], has become increasingly prevalent in Holland, particularly in the raspberry area near Breda. Experimental evidence has also been obtained that *Euscelis plebejus* transmits two virus diseases of clover [cf. 33, p. 298].

The strains of potato virus X differentiated at the Scottish Plant Breeding Station, Edinburgh [35, p. 116] by their effect on a number of test varieties were

described by G. Cockerham (pp. 89–90). The relationship between races and the genes controlling response appears similar to that already established for *Phytophthora infestans* [33, p. 250].

The induction of mutants in the necrotic spot (local lesion) strain of potato virus X by exposure to nitrogen mustard *in vivo* [34, p. 429] was dealt with by R. H. Larson, M. A. Stahmann, and J. C. Walker, Wisconsin (pp. 93–99). Repeated exposures of the virus to nitrogen mustard *in vitro*, however, did not result in mutation, indicating that the mutation of a plant virus is comparable to a change in the gene of a chromosome. Mutant strains of other plant viruses can be obtained by treatment *in vivo* with nitrogen mustard.

S. E. Hansen (pp. 100–101) described the spread of potato virus X in field experiments at Studsgaard, Denmark, in which rows of healthy Bintje potato plants were grown between rows of alternating healthy Bintje and virus X-infected *Dianella* plants. Over three years, 19, 20, and 14 per cent., respectively, of the X-free potato plants became infected in a season, the largest spread occurring in the rows containing infected *Dianella*.

J. Munro, Canada Department of Agriculture, discussed (pp. 102–106) the strains of potato virus Y in relation to potato varieties [35, p. 216]. A variety may be tolerant of some strains of virus Y and give a necrotic or resistant reaction to others when inoculated. Out of 17 strains tested only one caused a necrosis in all the potato varieties grown in Britain. The introduction of new varieties, resistant to the common strains only, may result in an increase in the importance of the less common strains, and this must be considered in breeding programmes.

R. Bercks, Brunswick (pp. 107–110), stated that although considerable damage is caused to tobacco plants by mixed infections of potato viruses X and Y (cf. *Phytopathology*, 42, 9, p. 473, 1952), the extent depending on climatic conditions, no relation could be found between the virus concentration, measured serologically, and the degree of injury.

Advances in research on resistance to leaf roll [*R.A.M.*, 35, p. 316] were outlined by Maria-Luise Baerecke, Max-Planck Institute, Voldagsen über Elze, Germany (pp. 111–119). No immunity was found in 39 wild species of *Solanum* but the inheritance of resistance appears to be polygenic, and by selfing and diallelic crosses progeny were obtained in which 8 to 9 per cent. of the seedlings remained healthy after artificial infection in two successive years.

A. Rozendaal and J. H. Brust, Wageningen (pp. 120–133), discussed the significance of potato virus S [34, p. 475] in seed potato culture. The occurrence, transmission, properties *in vitro*, and symptoms on a number of varieties were briefly considered. No varieties non-susceptible or hypersensitive to this virus have been found in Holland. The only method of control is by selecting plants free from the virus and multiplying them under conditions inimical to re-infection; it was estimated that by 1955 all Dutch seed potatoes would be free from virus S.

The possible relationship between carnation latent virus [35, p. 100] and potato paracrinkle virus was discussed in a paper by B. Kassanis, Rothamsted (pp. 134–135).

The effect of lucerne mosaic virus on potato [34, p. 429] was compared with that of potato aucuba mosaic virus [see below, p. 483] by J. W. Oswald, California, and A. Rozendaal and J. P. H. van der Want, Wageningen (pp. 137–146). The former virus, now widespread in Holland, was previously reported in Europe only from Bulgaria. Symptoms produced by the two viruses were similar but serological and cross-protection tests showed that they were distinct.

Lesser known potato viruses occurring in Germany were described by E. Köhler, Brunswick (pp. 148–152). Strains of tobacco ring spot virus cause potato bouquet [32, p. 274] and potato pseudo-aucuba diseases, the latter showing large, aucuba-like yellow spots on the leaves.

The appearance of a new potato disease, dwarf shrub virosis [34, p. 80], was described by F. Sprau, München, Germany (pp. 153–156).

Investigations on the use of *Gomphrena globosa* [see above, p. 480] for quantitative work were described by H. L. Paul, Brunswick (pp. 157–159). Potato virus X, potato bouquet virus, and potato virus D 1102 [strain of potato S virus: 34, p. 807] were differentiated by the symptoms induced on leaves of intermediate age in this host. In using untreated sap from tobacco plants infected with potato virus X the number of lesions produced was proportional to the concentration of virus within the limits $1:10^{-2}$ and $1:2\times10^{-5}$, but not with other hosts or purified sap.

A. G. Orad and F. P. San Roman, Vitoria, Spain (pp. 160–169), dealt with conditions associated with spindling sprout of potato in Spain [cf. 35, p. 223]. It is concluded that the disorder there is unconnected with viruses but that soil moisture and temperature are involved, and a straw mulch lessens the amount of disease. Characteristic symptoms when the plants are almost mature enable over 85 per cent. of affected tubers to be eliminated by roguing.

C. Martin, Versailles, France (pp. 171–176), contributed a description of a colorimetric test for diagnosing certain plant virus diseases by the use of 2-6-dichlorophenol-indophenol, which is coloured blue by sap from virus-diseased plants. In the tests 30 to 40 mg. in 100 ml. phosphate buffer were decolourized by adding a few drops of sodium bisulphite; one ml. of this fluid was mixed with a drop of sap. By this means dahlia mosaic, cucumber mosaic, and [tomato] spotted wilt viruses could be detected in mature dahlia leaves, and tobacco and cucumber mosaic viruses, and potato virus Y in tobacco. The test is also being tried on monocotyledons.

According to J. Pavillard, Paris (pp. 178–183), the concentrations of auxins and auxin precursors is much lower in potato plants infected by virus X, virus X plus virus Y, or leaf roll virus than in healthy ones, being very much less when the virus causes severe damage [cf. 29, p. 528; 31, p. 137].

A simplified electron microscope developed by the Philips Company, Eindhoven, was described by A. C. van Dorsten (p. 185). By means of a magnetic objective lens of very short focal length (f = 0·8 mm.) the instrument has been rendered insensitive to small fluctuations in current and voltage and obviates the necessity for complicated electronic equipment.

The reaction of some Italian potato varieties to virus diseases was described by R. Gigante, Rome (pp. 187–190). Potato viruses have only come into prominence in Italy since 1934, when the importation of foreign varieties began. Plants of the varieties Albona and San Michel are all affected by either potato virus X alone or in combination with virus Y.

A. Rozendaal, Wageningen (pp. 191–193), briefly outlined some virus problems in the potato, and discussed a strain of potato virus X causing a severe interveinal mosaic and necrosis in Duke of York; leaf roll virus-infected plants with stem necrosis, found in the greenhouse but not in the field; and the occurrence of field resistance to potato virus Y, many Dutch potato varieties being hypersensitive to the stipple streak strain of this virus.

Yarwood (C. E.) & Gold (A. H.). **Guar as a local lesion host of Potato virus S.**—*Plant Dis. Reptr*, 39, 8, p. 622, 1 fig., 1955. [Multilithed.]

Of the various hosts tested at the Department of Plant Pathology, University of California, Berkeley, for reaction to potato virus S [see preceding abstract] only guar (*Cyamopsis tetragonoloba*) showed symptoms, in the form of necrotic lesions 45 to 300 μ in diameter on the cotyledons, appearing within two days in each of the six trials. In one trial 1,058 lesions formed on 96 guar cotyledons previously dusted with carborundum and brushed with 1 per cent. suspension of leaf tissue of the potato USDA 41956 as inoculum. Examination by the electron microscope

of sap extracted from these lesions revealed rod-shaped particles typical of potato virus S.

Fukushi (T.), Shikata (E.), Shioda (H.), Sekiyama (E.), Tanaka (I.), Oshima (N.), & Nishio (Y.). **Insect transmission of Potato witches' broom in Japan.**—*Proc. imp. Acad. Japan*, 31, 4, pp. 234–236, 1955.

It is apparent from the results of recent experiments at the Potato Foundation Seed Farm, Iburi, Hokkaido, Japan, that the leafhopper *Ophiola flavopicta* is capable of transmitting the witches' broom virus from diseased potato [*R.A.M.*, 34, p. 476], red and alsike clovers, and *Vicia unijuga* to healthy potato plants. Presumably the virus is present in the roots of hibernating clover and *V. unijuga* plants and is subsequently spread to potato fields by the leafhoppers. The incubation period of the virus in potato plants was exceptionally long, ranging in some instances from 39 to 49 days and in others from 98 to 102. The relatively low percentage of successful transmissions may account for the somewhat infrequent appearance of witches' broom in potato stands.

Maris (B.) & Rozendaal (A.). **Enkele proeven met stammen van het X- en het aucubabontvirus van de Aardappel.** [Some experiments with strains of the X- and aucuba viruses of the Potato.]—*Tijdschr. PlZiekt.*, 62, 1, pp. 12–18, 6 figs., 1956. [English summary.]

From the results of inoculation experiments on chilli at the Laboratory for Phytopathology, Wageningen, Holland, with four strains of potato virus X and six of potato aucuba mosaic virus [*R.A.M.*, 32, p. 145 and above, p. 481], the symptoms induced by the two virus groups do not appear to overlap. Chilli may therefore be used as an indicator plant for potato aucuba mosaic virus. The local lesions produced by the potato virus X strains are predominantly well defined, circular, and necrotic, whereas those associated with aucuba mosaic (also necrotic) are diffuse, greyish-brown, and irregular. A frequent systemic symptom of infection by virus X is a distinct mottling, while the leaves attacked by aucuba mosaic are severely misshapen and turn abnormally dark green, with a greyish vein-clearing; moreover, the latter virus, in contrast to the former, is responsible for drastic stunting and even death of the plants. The pathogenicity of aucuba mosaic to chilli is enhanced by passage through *Nicotiana rustica*.

In a comparison of properties of potato tuber necrosis virus (a strain of lucerne mosaic virus) [loc. cit.] and aucuba mosaic, inducing closely similar symptoms, the thermal death point of two strains of the latter were found to lie between 59° and 61° C., as compared with 53° to 55° for the tuber necrosis virus [30, p. 283]. Both strains of the aucuba mosaic virus were permanently weakened by exposure to temperatures above 53°; in cross-protection tests the strains thus attenuated conferred premunity against the original more virulent ones. Lucerne plants inoculated with six strains of potato aucuba mosaic virus did not react by the development of symptoms, and the results of sap inoculations on chilli demonstrated the absence of aucuba mosaic infection from the lucerne plants. Oswald [loc. cit.] found it almost impossible to transfer the tuber-necrosis virus from chilli back to potato, but in the present experiments up to 30 per cent. infection developed on potato plants of the President variety inoculated with sap from chilli infected by aucuba mosaic virus. It is concluded from these results that there is no identity or near relationship between the two viruses.

Akeley (R. V.), Stevenson (F. J.), Folsom (D.), & Bonde (R.). **Breeding varieties of Potato resistant to Verticillium wilt in Maine.**—*Amer. Potato J.*, 33, 1, pp. 15–21, 1956.

Since none of the control methods applied to the wilt of potatoes due to

Verticillium albo-atrum [*R.A.M.*, 35, p. 226] have proved fully effective, a start has been made at the Plant Industry Station, Beltsville, Maryland, to breed varieties resistant to the disease. An account is given of seedlings and varieties tested and the results obtained are tabulated. Seedling variety 41956 and its derivatives 792–88 and 792–94 are highly resistant, and Ontario and Menominee are resistant, the latter, however, proving less so in Maine than in Idaho.

Riley (E. A.). **Late blight of Potatoes and Tomatoes in Northern Rhodesia.**—*Plant Dis. Reptr*, 39, 10, pp. 737–738, 1 map, 1955. [Multilithed.]

The report of *Phytophthora infestans* on potatoes and tomatoes in the Nkana mine garden in Northern Rhodesia has already been noticed [*R.A.M.*, 35, p. 92]. The disease was apparently introduced on seed potatoes and is of particular concern in view of the recent epidemic in Southern Rhodesia [34, p. 436].

Schaal (L. A.). **The inhibitory effect of phenolic compounds on the growth of Streptomyces scabies as related to scab resistance.**—*Phytopathology*, 45, 11, pp. 626–628, 4 figs., 1955.

Of six phenolic compounds tested at the Colorado Agricultural Experiment Station, chlorogenic acid [*R.A.M.*, 31, p. 454], caffeic acid, catechol, and tetrahydroxybenzoin proved effective in the inhibition of growth of *Streptomyces* [*Actinomyces*] *scabies* from potato tubers in pure culture on Czapek's agar, the effectiveness increasing with a rise in pH from 6 to 8·5. These results are considered to support the hypothesis that the mechanism of scab resistance in the tuber involves enzymatic oxidation of chlorogenic acid [cf. 35, p. 322], which produces a quinone toxic to the pathogen.

Ayers (G. W.) & Robinson (D. B.). **Control of Fusarium dry rot of potatoes by seed treatment.**—*Amer. Potato J.*, 33, 1, pp. 1–5, 1956.

Experiments on the control of dry rot of stored potatoes due to *Fusarium sambucinum* f. 6 [*Gibberella cyanogena*] and *F. caeruleum* [*R.A.M.*, 35, p. 323] were carried out by the Canadian Department of Agriculture, Ottawa, using the potato variety Sebago for the first-named pathogen, and Keswick for the second, both being susceptible to dry rot. It was shown during a three-year period that chemical treatment of seed pieces, by reducing the introduction of inoculum into the soil, greatly lowered the amount of dry rot that developed subsequently in the stored crop.

The 'seed' used in the trial was in part naturally infected and in part dipped in heavy spore suspensions of the fungi. Part of such seed was treated with semesan bel before planting. Tubers from the resulting crops were artificially bruised by dropping, and the amount of rot that then developed in storage was observed.

Typical results showed 12·9 and 8 per cent. rot in the Sebago crop from untreated artificially and naturally infected seed, respectively, as compared to 6 and 4·6 per cent. after fungicidal treatment. Corresponding figures for Keswick were 25 and 32 per cent. in the controls and 10·4 and 14·5 per cent. after treatment.

Katznelson (H.) & Sutton (M. D.). **Laboratory detection of Corynebacterium sepedonicum, causal agent of bacterial ring rot of Potatoes.**—*Canad. J. Bot.*, 34, 1, pp. 48–53, 1 pl., 1956.

In this joint contribution from the Bacteriology Division and the Botany and Plant Pathology Division, Canada Department of Agriculture, Ottawa, two methods of detecting potato bacterial ring rot (*Corynebacterium sepedonicum*), the Gram stain technique [*R.A.M.*, 24, p. 246] and the serological test [21, p. 40], were investigated with a view to developing a more reliable diagnostic procedure.

A method is described for isolating *C. sepedonicum* from inside infected tubers

avoiding introduction of surface organisms. Fluid from the vascular ring near the stem end is streaked on to agar containing 23 gm. Difco nutrient agar, 5 gm. each of tryptone, yeast-extract, and glucose, and 5 ml. each of salt solutions A and B (*Industr. Engng Chem.* (*Anal.*), 11, pp. 346–350, 1939) per l., with the pH adjusted to 7 to 7·2. Following incubation at room temperature for 48 hours a portion of the resulting growth film is smeared on a slide and Gram stained. Easily recognizable Gram-positive, pleomorphic rods, club-shaped forms, and globular elements are obtained. This procedure should preferably be combined with examination also of Gram-stained smears direct from diseased material.

Antiserum was prepared from rabbits using a stock culture of *C. sepedonicum* C 5850, which agglutinated all the strains of the ring rot organism used in this study, whereas that from another culture did not. Obtaining a suitable strain for antiserum production is a most important factor.

Gigante (R.). **Osservazioni sulla comparsa della 'maculatura ferruginea' nei tuberi di Patata.** [Observations on the appearance of 'rust spot' in Potato tubers.] —*Boll. Staz. Pat. veg. Roma*, Ser. 3, 12 (*1954*), pp. 105–113, 5 figs., 1955. [English summary.]

Continuing his studies on internal rust spot of potatoes [*R.A.M.*, 35, p. 226], the author in 1954 planted halves of spotted and unspotted tubers from the same stocks of the varieties Home Guard and Majestic in eight widely separated localities in Italy. Whether the 'seed' was spotted or unspotted appeared to have very little effect on the incidence of the condition in the progeny, a high proportion of which (20 to 53 per cent.) was affected in most areas.

A study of the rate of incidence in the different sites showed that internal rust spot appeared most frequently in those areas where wet and dry periods alternated during the formation and ripening of the tubers, and it is concluded that the presence of the disease is closely related to the occurrence of such conditions. In dry areas it was absent or negligible.

Wright (N. W.). **Surface pitting of Potato tubers in the Pacific Northwest.**—*Plant Dis. Reptr*, 39, 7, pp. 587–588, 1 fig., 1955. [Multilithed.]

Surface pitting affected potato tubers in storage in British Columbia during the winter of 1954–5 and was observed in shipments from Washington in 1955. The dark, superficial lesions were fairly evenly distributed over the surface of the tubers, subsurface injury being limited to a thin brown layer of dead cells. The varieties involved were Netted Gem, White Rose, and Green Mountain. No lesions developed in whole and freshly injured potatoes and carrots inoculated with necrotic pit tissue, indicating that the disorder is not caused by a parasite but possibly by adverse storage conditions. While the pits do not constitute a serious grade defect they serve as infection courts for rot-producing organisms. When pitted tubers were washed and held for a day or longer in sacks in common storage or in heated stores they almost invariably rotted, but not when they were marketed without being washed or if washed samples were dried thoroughly and kept in the dry atmosphere of a heated room.

Bazán de Segura (Consuelo). **El quemado del Arroz en Lambayeque.** [Rice blast in Lambayeque.]—*Bol. Exp. agropec., Lima*, 3, 2, pp. 2–5, 1954.

A survey during October, 1953, of the upper part of the Zaña Valley, Lambayeque, Peru, revealed that rice blast (*Piricularia oryzae*), reported for the first time a few months earlier [*R.A.M.*, 33, p. 378], had almost disappeared. It had attacked nursery plants severely, but when those least affected were planted out they appeared to develop normally. Furthermore, the nursery plants that had been abandoned appeared to be suffering more from neglect than from blast. The

brief but severe epiphytotic earlier in the year is therefore attributed to abnormal climatic conditions prevailing at that time [loc. cit.].

Jodon (N. E.). **Toro and Sunbonnet, two new midseason, long-grain Rice varieties compared.**—*Rice J.*, 58, 13, pp. 8–11, 1955.

This is a detailed study of the performance of two rice varieties at the Rice Experiment Station, Louisiana, in 1952–4. Their disease resistance has already been noticed from other sources [*R.A.M.*, 32, p. 449; 34, p. 482]. Toro proved to be resistant to *Cercospora* [*oryzae*] leaf spot also.

Domsch (K. H.). **Zur Wirkung von Beizmitteln gegen Bodenpilze. I.** [On the action of plant protectives against soil fungi. I.]—*Phytopath. Z.*, 25, 3, pp. 311–322, 3 graphs, 1956.

In laboratory experiments at the Kiel-Kitzeberg (Schleswig-Holstein) branch of the German Biological Institute to determine the possibility of combating soil fungi by means of seed disinfection [cf. *R.A.M.*, 32, p. 412 *et passim*], a preparation having methoxyethyl-mercury-silicate as the active ingredient with an admixture of 20 per cent. hexachlorobenzene was used as the standard fungicide, a strain of *Rhizoctonia* [*Corticium*] *solani* isolated from aster as the pathogen, and pea as the host.

A measure of protection was conferred by the treatment only in sand, the growth of the fungus on this substratum being estimated at 45 per cent. of the controls, as compared with 65 in turf, 70 in compost and leaf mould, 80 in manure, and 90 in ordinary garden soil. It was found necessary to apply the disinfectant at excess rates (over 10 gm. per kg.) to ensure the formation of effective zones of inhibition. The latter were produced, moreover, only by seeds of 3 to 4 mm. in diameter, and no protection can be expected for those below 1 mm.

Soil moisture and temperature exerted little influence on the disinfectant action, but extremes of acidity and alkalinity appeared to enhance the sensitivity of the pathogen to seed treatment. The growth of other unidentified species was much more readily inhibited than that of *C. solani*.

In a test including other fungicides besides the standard, an organic arsenic-containing compound at an excess dosage completely suppressed the development of *C. solani* on sand, but on compost its efficiency was greatly reduced.

A simple colorimetric method for the assay of the adsorptive capacity of soils with different physical properties for an organic mercurial disinfectant is described. It involves the use of filter paper strips soaked in a 1 per cent. alcoholic diphenylcarbazole solution.

Lingle (J. C.) & Holmberg (D. M.). **Zinc-deficient crops.**—*Calif. Agric.*, 10, 2, pp. 13–14, 3 figs., 1956.

Zinc sprays increased the yields of certain annual crops in Yolo County, California, in 1955 [cf. *R.A.M.*, 34, p. 253]. Zinc deficiency in sweet corn [maize: 35, pp. 292, 325] caused light interveinal chlorosis, increasing to a broad, bleached stripe, and delayed flower development. Manganese deficiency occurred also, and a spray containing the two elements increased the average crop weight per pot in greenhouse experiments from 121·5 gm. in the untreated to 266·8 gm. Field trials gave similar results. Zinc deficiency of snap beans [*Phaseolus vulgaris*] and Lima beans [*P. lunatus*] causes small, reddish-brown spots, followed by slight interveinal yellowing of older leaves, and in tomatoes a faint interveinal yellowing is sometimes followed by slight bronzing of the upper leaf surface, while in severe cases elongated, brownish spots appear on the veins. Zinc-deficient sugar beets are stunted, with interveinal yellowing of older leaves; they responded to sprays of zinc sulphate or chelate applied alone, or together with manganese sulphate or chelate as 0·5 per

cent. solutions at about 100 gals. per acre, yields being increased to 31·4 to 34 tons per acre as compared to 17·7 in the controls. Soil applications were in no case as effective as sprays.

Evans (E.). **Survival and recolonization by fungi in soil treated with formalin or carbon disulphide.**—*Trans. Brit. mycol. Soc.*, 38, 4, pp. 335–346, 1 diag., 2 graphs, 1955.

In further studies at the Botany School, University of Cambridge, on the recolonization of treated soil [cf. *R.A.M.*, 33, p. 561], *Trichoderma viride* had established itself as the dominant fungus in soil samples taken three weeks after treatment with 1 in 500 to 1 in 1,000 formalin, the dominance persisting throughout the six-month sampling period. On agar *T. viride* was more tolerant of formalin than *Gliocladium roseum*, *Mucor spinosus*, *Zygorrhynchus vuilleminii*, *Rhizopus stolonifer*, *Penicillium citrinum*, *Fusarium culmorum*, or *F. caeruleum*. *T. viride* also became dominant after soil treatment with carbon disulphide at 0·5 ml. to 250 gm. moist soil. At 1 to 10 ml. dominance was taken over by *P. luteum* and *Aspergillus fischerii* which were highly tolerant of carbon disulphide *in vitro*. Recolonization of treated soil from an inoculum of unsterilized soil and movement of disinfectants were followed by means of recolonization tubes [loc. cit.]. Formalin was shown to have moved at least 2 in. from the point of injection in 4 hours but not as far as 4 in. It failed to suppress the fungi only at the lowes moisture content (22 per cent.).

Carbon disulphide spread at least 4 in. from the point of injection in 48 hours and most of the fungi were killed at 2 in. The number of bacterial colonies, however, was highest at the point of injection and decreased with distance, suggesting that the bacteria could develop only in the absence of fungus competition.

Kljajić (R.). Прилог проучавању паразитне микрофлоре лековитих биљака на подручју Малог и Великог Јастребца и Голије у току 1954 године. [A contribution to the knowledge of the parasitic microflora of medicinal plants at the foot of Mali and Veliki Jastrebac and Golija in 1954.]—Зборн. Радова пољопр фак., Београд [*Rev. Res. Fac. Agric., Beograd*], 3, 1, pp. 223–236, 4 figs., 1955. [English summary.]

In continuation of the census of the parasitic microflora of medicinal plants in Yugoslavia [cf. *R.A.M.*, 34, p. 752] the following were found to be widespread at the foot of the Mali and Veliki Jastrebac and Golija mountains in 1954 and are considered to be important parasities: *Erysiphe lamprocarpa* on *Hyoscyamus niger*; *E. communis* on *Hypericum perforatum*, *Valeriana officinalis*, *Aconitum lycoctonum* [*A. vulparia*], and *Caltha palustris*; *E. cichoracearum* on *Telekia speciosa* [*Buphthalmum speciosum*]; *E. martii* and *Ramularia urticae* on *Urtica dioica*; *E. ulmariae*, *Septoria grevillensis*, and *Triphragmium ulmariae* on *Filipendula ulmaria*; *Puccinia malvacearum* on *Althaea officinalis* and *Malva sylvestris*; *R. atropae* on *Atropa belladonna*; *R. brunnea* on *Tussilago farfara*; *R. valerianae* on *V. officinalis*; *R. variabilis* on *Verbascum phlomoides*; *R. menthicola* on *Mentha longifolia*; *R. aequivoca* on *Ranunculus repens*; *Ramularia decipiens* on *Rumex alpinus*; *Cercospora calthae* on *Caltha palustris*; *Cercospora dubia* [35, p. 61] on *Chenopodium bonus-henricus*; *Septoria tormentillae* on *Potentilla tormentilla*; *S. colchici* on *Colchicum autumnale* [34, p. 752]; *S. digitalis* on *Digitalis ferruginea* [33, p. 756]; *Puccinia asarina* on *Asarum europeum*; *P. menthae* on *Calamintha officinalis* and *M. piperita*; *P. mammillata* on *Polygonum bistorta*; and *Puccinia glechomatis* on *Salvia glutinosa*.

Golenia (A.). **Przetrwalnikowe stadium pleśni szarej (Botrytis cinerea Persoon) na Rączniku.** [Sclerotia of grey mould (*Botrytis cinerea* Persoon) on Castor Bean.] —*Acta microbiol. polonica*, 4, 2, pp. 153–157, 1 pl., 2 figs., 1955. [Russian and English summaries.]

A description is given of field and laboratory studies of *Botrytis cinerea* on castor

bean (*Ricinus communis*) [cf. *R.A.M.*, 33, pp. 447, 632] in Poland. In nature the fungus was found to overwinter on the stems in the form of sclerotia, producing numerous conidiophores in the spring. The author's description of the sclerotia differs from that of other authorities (including Jörgensen [28, p. 187] and Butler and Jones [29, p. 319]).

Cook (A. A.). **Sclerotinia sclerotiorum on Castorbean in Florida.**—*Plant Dis. Reptr*, 39, 7, pp. 585–586, 3 figs., 1955. [Multilithed.]

Sclerotinia sclerotiorum was recorded on castor bean [*Ricinus communis*: cf. *R.A.M.*, 33, p. 632] at Goulds, Florida, following a cool period during the winter of 1954. In the greenhouse slight infection and necrosis were obtained by inserting a small piece of mycelium from an agar culture into young stems.

Spillner (H.). **Ertragsminderung an Majoran durch Alternaria-Blattbefall.** [Yield reduction in Marjoram through *Alternaria* leaf infection.]—*Pflanzenschutz*, 7, 11, pp. 163–164, 4 figs., 1955.

An unidentified species of *Alternaria* is reported to have caused an average reduction of 15 per cent. in a crop of marjoram (*Origanum majorana*) covering an area of 50 ares [5,000 sq. m.] in the Müllheim district of Baden, Germany, during the summer of 1955. No previous record of a similar disease on the same host could be traced. The older leaves, some of which had turned greyish-brown, had already fallen by mid-August, while those remaining were spotted and dropped at a touch.

Thomas (C. A.). **A new race of Safflower rust.**—*Plant Dis. Reptr*, 39, 8, pp. 652–653, 1955. [Multilithed.]

In inoculation experiments at the Field Crops Research Branch, Beltsville, Maryland, the safflower variety W.O. 14, resistant to rust (*Puccinia carthami*) [*R.A.M.*, 34, p. 321], and other resistant selections were susceptible to race 2 of the rust, a new race first observed in 1954 in one field in California. In 1955 many of the lines resistant to the common race were affected by rust, indicating that the new race may cause serious damage.

Frydman (Mme I.). **Badania nad mykotrofizmem Wilczej Jagody (Atropa belladonna L.) w naturalnych i sztucznych warunkach rozwoju oraz próby powiązania tego zjawiska z zawartością atropiny.** [Studies on mycotrophism of Deadly Nightshade (*Atropa belladonna* L.) under natural and artificial conditions of development and trials in associating this phenomenon with atropine content.]—*Acta Soc. Bot. Polon.*, 24, 1, pp. 109–123, 9 figs., 1955. [English summary.]

Studies carried out from 1949 to 1953 at Wrocław, Poland, showed that the atropine content of the leaves of *Atropa belladonna* plants grown under the natural conditions of its mountain association was usually 0·25 to 0·54 per cent., and in those of artificially cultivated plants 0·26 to 0·59 per cent. In nature *A. belladonna* develops an abundant endotrophic mycorrhiza of the thamniscophagic type, while cultivated plants develop the thamniscophagic or the tolypophagic type. The addition of soil from the natural habitat to the cultivated plants gave inconsistent results in different localities as regards atropine content, and the plant appears to be able to find symbiotic fungi in soils not natural to it.

Fernier (H.). **Contribution à l'étude d'une rouille de Strophanthus sarmentosus due à Hemileia smallii Wakef. et Hansford.** [A contribution to the study of a rust of *Strophanthus sarmentosus* due to *Hemileia smallii* Wakef. & Hansford.] —*Rev. Mycol.*, 19, *Suppl. colon.* 2, pp. 58–63, 3 figs., 1954.

On the leaves of young *Strophanthus sarmentosus* plants growing in the nursery

of the Agricultural Research Station, Boukoko, Ubangui, French Equatorial Africa, *Hemileia smallii* [*R.A.M.*, 31, p. 633] produces blisters 5 to 6 mm. in diameter and usually 2 to 3 mm. (or sometimes up to 5 mm.) deep. In severe outbreaks they may become confluent, forming lesions over 1 cm. long; young leaves may be completely covered and deformed.

Teleutosori were observed on two occasions; the hyaline, unicellular teleutospores were applanate, top-shaped when young, and measured 17 to 20 by 11 to 15 μ. From the central body, filamentous expansions grow out, giving the teleutospore an angular, deeply lobate appearance, and increasing the diameter up to 40 μ. The teleutospores have not hitherto been described, and the necessary addition is therefore made to the diagnosis.

Abbott (E. V.). **Tolerance to dilution and heat of six strains of the Sugarcane mosaic virus.**—*Proc. (eighth) Congr. int. Soc. Sug. Cane Tech., Barbados, 1953*, pp. 911–913, 1954.

Six different strains of sugar-cane mosaic [*R.A.M.*, 18, p. 621] were tested at the Division of Sugar Plant Investigations, United States Department of Agriculture, to discover whether their varying degrees of tolerance of heat and dilution could be used as a means of distinguishing certain strains showing similarity of symptom expression. Strain F was inactivated at 47° C., strain Db at 51°, and A, B, C, and D at 53° [cf. 24, p. 339]. Strains D and Db, similar to C in symptom pattern on C.P. 31/294, showed greater tolerance of dilution than C. The dilution end-point of strains B & C was 1 in 1,000, and of F 1 in 100.

Singh (K.). **Phytophthora rot of Sugarcane.**—*Diss. Abstr.*, 15, 9, p. 1486, 1955.

In disease surveys for germination failures of sugar-cane seed pieces in Louisiana made in the springs of 1953, 1954, and 1955, two phycomycetes were frequently isolated, one of which was *Phytophthora erythroseptica* [*R.A.M.*, 30, p. 389] and the other is termed the 'sterile isolate'. Studies on this isolate at Louisiana State University demonstrated that sporangia and oogonia [? of *Phytophthora*] were produced on the young roots near the root tips. *P. erythroseptica* grew best at 21° C. and the sterile isolate at 11°. The optimum pH for both was 3·9 to 4 followed by 6·3 to 6·6. In inoculation experiments the sterile isolate was more pathogenic than *P. erythroseptica*. Soil moisture levels of 50 to 80 per cent. were most favourable for *Phytophthora* infection, the pathogenicity of different varieties varying with the moisture content. Isolations from infected nodes indicated that the infection may have occurred through the root primordia. It appears therefore, from these studies, that widespread stand failures due to *Phytophthora* rot may be expected in cool, wet winters, particularly in areas with heavy soils, a high water table, and bad drainage.

Groves (J. W.) & Hoare (Sheila C.). **Notes on fungi from Northern Canada. I. Hypocreales and Discomycetes.**—*Canad. Fld Nat.*, 68, 1, pp. 1–8, 1954.

Groves (J. W.) & Thomson (Sheila C.). **Notes on fungi from Northern Canada. II. Boletaceae.**—Ibid., 69, 2, pp. 44–51, 1955.

During the summers of 1948–51 survey parties in Northern Canada collected a number of fungi, including *Cordyceps militaris* on lepidopterous larvae from Newfoundland and *Claviceps purpurea* in a number of grasses [*R.A.M.*, 35, p. 157], 23 Discomycetes, and 12 Boletaceae, which are listed together with descriptions and taxonomic notes.

Grasso (V.). **Rassegna delle specie di Claviceps e delle loro piante ospiti. Parte II.** [A check-list of the species of *Claviceps* and their host plants. Part II.]—*Ann. Sper. agr.*, N.S., 9, 2, *Suppl.* pp. XCVII–CXII, 1955. [English summary.]

In this concluding part of his paper [*R.A.M.*, 35, p. 237] the author lists the host

species on which the conidial state only of *Claviceps* has been found, with (in each case) the corresponding geographical record and reference to the bibliography, which comprises 284 titles.

Jenkins (Anna E.) & Bitancourt (A. A.). **Notas sôbre as antracnoses maculadas e assuntos correlatos. VII. Novos espécimes do Brasil meridional.** [Notes on the spot anthracnoses and cognate subjects. VII. New specimens from southern Brazil.]—*Biológico*, 21, 11, pp. 204–210, 1 pl., 1955. [English summary.]

New records for Brazil in this critically annotated list of *Elsinoe* and *Sphaceloma* spp. [cf. *R.A.M.*, 19, p. 366] are *E. eucalypti*, originally described by [C. G.] Hansford from Australia (*Proc. Linn. Soc. N.S.W.*, 79, p. 98, 1954), which produces on eucalyptus leaves in Rio Grande do Sul, amphigenous, irregularly rounded, salient, rugose, sharply defined, dark chestnut-coloured spots, up to 4 mm. in diameter or confluent, with ash-grey centres; *S. violae* on sweet violet [*R.A.M.*, 26, p. 153], also in Rio Grande do Sul; *S. poinsettiae* on *Euphorbia pulcherrima* [21, p. 455], *E. puertoricensis* on *Randia spinosa*, *E. veneta* on *Rubus* sp., and *E. piri* on quince, apple, and pear in São Paulo and on pear in Paraná.

Among the species which have extended their range are *S. psidii* [30, p. 434] on *Feijoa sellowiana* (a new host) and *E. batatas* on sweet potato [23, p. 1], both found for the first time in Rio Grande do Sul, and *S. rosarum* [12, p. 96] which has spread to Paraná. Attention is also drawn to the continued prevalence of *E. australis* on sweet oranges [C.M.I. map No. 55] in Rio Grande do Sul and São Paulo and of *S. perseae* on avocado [*R.A.M.*, 14, p. 459] in the latter State.

Săvulescu (T.). **Ustilaginales der rumänischen Volksrepublik.** [Ustilaginales of the Rumanian People's Republic.]—84 pp., Verlag der Akademie der Rumänischen Volksrepublik, 1955.

Information is presented on the geographical distribution, life-cycles, and hosts of the Ustilaginales of Rumania [cf. *R.A.M.*, 19, p. 731 *et passim*]. There are 194 species, which are further subdivided into seven groups of 'floristic elements of the world mycoflora', viz., European, comprising 35·78 per cent. of the total, Euro-Siberian (11·27), Euro-Asiatic (2·94), circumpolar (25·45), cosmopolitan (18·13), Mediterranean-Pontic (0·98), and endemic (3·92). The monograph also comprises a bibliography of 116 titles and keys to the families, genera, and species.

Mention may be made of *Ustilago crameri* on *Setaria italica* and *S. viridis* [C.M.I. map No. 239], *U. avenae* on oats [No. 238], *U. nigra* on two-rowed and six-rowed barley, *U. vavilovi* on rye, *Sphacelotheca sorghi* on sorghum, sweet sorghum variety Kansas Orange, and *Sorghum halepense* [No. 220], and *Urocystis tritici* on wheat [No. 80].

Mayor (E.). **Le Sorosporium de Dianthus caryophyllus L. ssp. silvester (Wulfen) Rouy et Fouc.** [*Sorosporium* on *Dianthus caryophyllus* L. ssp. *silvester* (Wulfen) Rouy & Fouc.]—*Ann. Éc. Agric. Montpellier*, 29, 3–4 (numéro spécial dédié au Professeur G. Kuhnholtz-Lordat), pp. 141–147, 2 figs., 1954.

Sorosporium purpureum was isolated in June, 1952, from a single wild plant of *Dianthus caryophyllus* near Saint-Blaise, Neuchâtel, France. Its systematic position is discussed [cf. *R.A.M.*, 34, p. 65].

Baxter (J. W.). **Proof of the connexion between buckeye rust, Aecidium aesculi, and Puccinia andropogonis.**—*Plant Dis. Reptr*, 39, 8, p. 658, 1955. [Multilithed.]

In greenhouse experiments at the Department of Botany and Plant Pathology, Iowa State College, Ames, young plants of *Andropogon gerardi*, grown from seed in

the greenhouse, were inoculated with aecidiospores of *Aecidium aesculi* collected on *Aesculus glabra*. Ten days later uredosori of *Puccinia andropogonis* [*R.A.M.*, 18, p. 11] developed on the inoculated plants.

STEYAERT (R. L.). **Pestalotia, Pestalotiopsis et Truncatella.** [*Pestalotia, Pestalotiopsis* and *Truncatella.*]—*Bull. Jard. bot. Brux.*, 25, 2, pp. 191–199, 1955.

In answer to Servazzi's recent rejection of *Pestalotiopsis* and *Truncatella* [*R.A.M.*, 34, p. 260], the author recapitulates the early history of the genus *Pestalotia* (type species, *P. pezizoides*). The important characters distinguishing the type from the other species which have been included in *Pestalotia* (*sensu lato*) are: (1) the apothecoid form of the fructification; (2) the long, branched conidiophores, each ramification of which bears a single conidium; and (3) the curious pseudo-septation of the coloured locules of the conidia. In *Pestalotiopsis* and *Truncatella* the fructifications are acervular, pycnidiform, or hyphomycetoid. The principal distinguishing feature of *Pestalotia* (*sensu stricto*) is the stromatoid mycelium rupturing the host epidermis and producing conidiophores and conidia at the surface in free air, whereas in the other two genera conidia are produced in a subcutaneous conceptacle and the rupture or ostiolation of this organ and of the epidermis occurs only when the conidia are released. Instead of transverse septa, the young conidia of *P. pezizoides* have rings supporting the wall. Each locule so formed later becomes filled with a large, refractive, rather vitreous, spherical body. In *Pestalotiopsis* and *Truncatella* thin walls distinctly mark off the cells even at an early stage, and at maturity they thicken considerably. These features are considered to be sufficiently distinct generic characters.

The conidium of *Pestalozziella* is similar in all respects to that of *Truncatella* except that the two coloured cells have not developed. Species of *Truncatella* have been recorded only from temperate regions, those of *Pestalotiopsis* from all parts of the world; the former occur mostly on Gymnosperms, whereas the latter have a much wider distribution, occurring on living plants, various forms of detritus, soil (in Europe and Africa), and even in sea-water.

VAN DER KNAAP (W. P.). **Notes on disease incidence of Exobasidium vexans on Tea.**—*Arch. Theecult. Ned.-Ind.*, 19, 2, pp. 99–113, 3 graphs, 1955. [Indonesian and Dutch summaries.]

In further studies on blister blight (*Exobasidium vexans*) of tea in West Java [*R.A.M.*, 33, p. 324; 34, p. 551], the following criteria (especially the third) were found to be serviceable in the calculation of disease incidence: (1) weight of the infected shoots expressed as a percentage of the total weight of the yield; (2) number of infected shoots per kg.; and (3) percentage of infected third leaves. It is doubted whether the close correlation already demonstrated [loc. cit.] between hours of sunshine (especially in the morning) and intensity of infection can be usefully applied in connexion with the control programme.

GRUSHEVOI (S. E.). Болести на Тютюна и система от мероприятия за борба с тях [Tobacco diseases and a system of measures for their control.]—172 pp., 18 figs., Zemizdat, Sophia, 1952. [Received 1955.] 135 l.

Tobacco diseases, including those caused by viruses, bacteria, and fungi, are described in part one of this book, which is a Bulgarian translation from Russian. Part two is devoted to control, with special reference to tobacco grown for seed, nursery seedlings, and field crops.

OWEN (P. C.). **The respiration of Tobacco leaves after systemic infection with Tobacco mosaic virus.**—*Ann. appl. Biol.*, 43, 2, pp. 265–272, 2 graphs, 1955.

In investigations at Rothamsted Experimental Station into the respiration of tobacco leaves removed from plants with systemic infection by tobacco mosaic

virus [*R.A.M.*, 35, p. 346] the rate of carbon dioxide production per gm. of dry matter of the younger leaves was about 10 per cent. less than that of comparable healthy leaves; in older leaves there was no difference. These results were independent of seasonal change in light conditions during the growth of the plants. Since exposure to light greatly affects the water content of leaves, variation in illumination is a possible source of error in results expressed on a fresh weight basis. Older, but not younger, leaves of infected plants had a lower initial water content, and both absorbed less water during the 20-hour experimental period in an almost saturated atmosphere, the petioles dipping in water, than leaves from healthy plants. The difference in initial water content was great enough to conceal a decrease in respiration due to infection, and differences in the water uptake of detached leaves were sufficient to reverse such an effect when respiration was expressed in terms of fresh weights. As some published results on this subject depend on data obtained from fresh weights, this appears to be one cause of apparent contradictions between results of other workers. The only safe basis for expressing the results of such experiments is on dry matter.

From this and the earlier work it is concluded that the respiration rates of mosaic tobacco leaves can be higher or lower than or identical with those of healthy leaves, depending upon the time that has elapsed since inoculation, the physiological condition of the plants, the environmental conditions during growth, the particular leaves chosen, and the mode of expression of the results.

Gualaccini (F.). **Una probabile mutazione del virus del mosaico del Tabacco trasmessa, e forse anche prodotta, dalla Cuscuta pentagona Engelm.** [A probable mutation of the Tobacco mosaic virus transmitted, and perhaps even produced, by *Cuscuta pentagona* Engelm.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 12 (*1954*), pp. 137–165, 16 figs., 1955. [English summary.]

In an experiment carried out in 1954 in a greenhouse of the Station of Plant Pathology, Rome, a healthy Herzegovina and a healthy Perustitza tobacco plant were connected by means of the strands of *Cuscuta pentagona* with a tobacco plant of undetermined variety affected by ordinary tobacco mosaic virus. Later, the Herzegovina plant developed symptoms of ordinary tobacco mosaic virus, but the leaves of the Perustitza plant bore necrotic symptoms resembling those of tobacco streak virus, these being followed by necrotic oak-leaf patterns, interveinal necrotic spots, and finally by symptoms of ordinary mosaic virus. Inoculations to six differential hosts with sap from the Perustitza leaves bearing the necrotic symptoms gave only symptoms of the ordinary mosaic. It is concluded that *C. pentagona* transmitted to tobacco a mutant of ordinary tobacco mosaic virus, probably produced by the *Cuscuta* plant.

Angell (H. R.) & Wark (D. C.). **Blue mould of Tobacco. I. Weeds in relation to disease percentages in young transplants.**—*J. Aust. Inst. agric. Sci.*, 21, 2, pp. 104–106, 1955.

In November, 1954, the writers inspected tobacco fields in the Orens River Valley, Victoria, in which hoeing had been discontinued during wet weather; the soil was caked and bore a heavy cover of weeds. Of 3,300 tobacco plants in the rows not hoed and the same number in those hoed, 1,330 and 809, respectively, were visibly infected by blue mould (*Peronospora tabacina*) [*R.A.M.*, 34, p. 434] ten days after hoeing had ceased.

The fact that in the only field in which the unhoed rows were almost free from weeds there were more diseased plants in the hoed than in the unhoed suggests that the higher incidence of infection in the unhoed in the other fields could be ascribed to the presence of weeds near the plants. By delaying the drying of dew and rain, the weeds may have favoured the germination of the spores of the pathogen.

Wolf (F. A.). **Production of Turkish or oriental Tobaccos having tolerance to black shank.**—*Agron. J.*, 48, 1, pp. 40–41, 1956.

In an attempt to develop oriental tobacco varieties tolerant of black shank [*Phytophthora parasitica* var. *nicotianae*] in North Carolina [*R.A.M.*, 34, p. 187; 35, p. 47], flue-cured lines previously developed near Oxford, North Carolina, and Chatham, Virginia, and possessing a high degree of tolerance were used as pollen parents for crossing with desirable Samsoun, Smyrna, and Cavalla types. The progeny were planted in an infested field, with further soil inoculation to ensure abundant infection. Later generations were grown in the greenhouse during autumn and winter and plantings of selected progenies were made in two other heavily infested fields to test for tolerance of different strains of the pathogen.

There were wide ranges in tolerance and other characteristics among individual plants in the F_2. The progeny from F_2 selections have continued to vary, but some strains have shown tolerance up to seed maturity while still resembling the oriental parent. Any adverse modification in yield or quality has yet to be determined. No strain appears to be immune. Tolerance appears to depend on multiple genes, but the number is not yet determined.

Sutton (W. S.). **Yellow top disease of Tomatoes.**—*Agric. Gaz. N.S.W.*, 66, 12, pp. 655–658, 3 figs., 1955.

A new virus disease of outdoor tomatoes has become prominent in coastal areas of New South Wales during the last five years [*R.A.M.*, 35, p. 355]; it is rare under glass. Known variously as golden top, purple top, Grosse Lisse disease, and yellow top, the last name has now been officially adopted [cf. 24, p. 342]. The yellow colour, originating as a narrow marginal border, increases until most of the leaflet is affected, the leaves and leaflets being reduced in size and characteristically curled. In cool weather purple may replace the yellow. Affected shoots tend to assume a stiff, upright habit. Except for occasional flower buds, no part of the plant is killed. The effect on fruit set is variable; fruit is reduced in size, but still marketable. The disease has been transmitted vegetatively though not mechanically, and the vector has not yet been discovered.

Gigante (R.). **La maturazione a chiazze dei frutti di Pomodoro.** [Blotchy ripening of Tomato fruits.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 12 (*1954*), pp. 127–136, 6 figs., 1955. [English summary.]

In recent years, the author has received from many different parts of Italy mature tomato fruits with green and yellowish areas irregularly distributed over the surface. Histological examination showed the condition to be identical with that described as 'blotchy ripening' [*R.A.M.*, 15, p. 539]. There was no evidence that the trouble was associated with potassium or nitrogen deficiency [cf. 17, p. 777]; indeed, some affected fruits had been grown in soils given heavy applications of nitrogen or with a high potassium content. The author's observations indicated that the condition occurred when dry weather followed a wet spell during the ripening period [cf. 24, p. 91] and appears to be associated with unbalanced moisture conditions.

Gigante (R.). **Il 'rachitismo cespuglioso' del Pomodoro.** [Bushy stunt of Tomato.] —*Boll. Staz. Pat. veg. Roma*, Ser. 3, 12 (*1954*), pp. 43–56, 10 figs., 1955. [English summary.]

In September, 1954, tomato plants growing at Maccarese, near Rome, became affected by a severe wilt marked by reduction and deformation of the upper leaves, reduced growth of the fruits, shedding of the flowers and young fruits, a reddish discoloration of the lower leaves in advanced stages of the condition, and a dwarfed, bushy appearance of the plants. Inoculations of healthy tomato, tobacco, chilli,

Nicotiana glutinosa, and cowpea plants with sap from infected tomato leaves gave rise to characteristic symptoms of tomato bushy stunt virus [C.M.I. map No. 178].

Goswami (T. K.) & Baruah (H. K.). **Infection of Tomato seedlings by Fusarium oxysporum (Schlecht) sensu Sny. et Hans.**—*Sci. & Cult.*, 21, 7, pp. 387–390, 1 fig., 1956.

Studies at the Department of Botany, Gauhati University, India, on two morphologically similar strains of *Fusarium oxysporum* from tomato plants killed locally by extensive collar decay in 1954 [*R.A.M.*, 33, p. 692] showed that strain I occasionally affected sound tissues of a wild, small-fruited variety but not of a commercial, large-fruited variety. Strain II was the more virulent, but both invariably infected the plant when the inoculum was applied to wounded roots and stems, though not when in contact with sound roots. The infection percentages ranged from 20 to 100 for strain II and 50 to 80 for strain I.

Conover (R. A.). **Several years' comparisons of 'good' Tomato fungicides.**—*Proc. Fla hort. Soc.*, 67 (*1954*), pp. 127–129, 1955.

In tests carried out during the six seasons from 1948 to 1954 at the Sub-Tropical Experiment Station Farm, Dade County, Florida, tomato plants sprayed on a three- to seven-days schedule with zineb (2 lb. per 100 gals.) gave an average yield of 381 60-lb. crates of fruit per acre, of which 227 were marketable, as against 350 and 191 crates, respectively, for the plants treated with 2 quarts nabam plus 0·75 lb. (in some experiments, 1 lb.) zinc sulphate. The lower percentage of marketable fruit given by the latter was partly due to spray injury. Except during 1948–9, when grey leaf spot (*Stemphylium solani*) [*R.A.M.*, 35, pp. 50, 334] was severe, late blight (*Phytophthora infestans*) [loc. cit.] was the only important foliage disease.

From 1951 to 1954 zineb-treated plants averaged 401 crates (223 marketable) per acre; the corresponding figures for nabam plus zinc sulphate were 350 and 179; for maneb (1·5 lb.) 419 and 244; and for nabam (2 quarts) plus 1 lb. manganese sulphate, 417 and 242.

In view of these results the author considers that the list of fungicides recommended for use on tomatoes in Dade County should be amended to include zineb, maneb, and nabam-manganese sulphate, nabam-zinc sulphate to be withdrawn.

Conover (R. A.). **Control of bacterial spot in Tomato fields with streptomycin-terramycin sprays.**—*Plant Dis. Reptr*, 39, 8, pp. 611–615, 1955. [Multilithed.]

In an experiment in the autumn of 1954 at the University of Florida Sub-Tropical Experiment Station, Homestead, on the control of bacterial spot (*Xanthomonas vesicatoria*) of tomato [*R.A.M.*, 35, pp. 52, 334] seven streptomycin-terramycin (agromycin) (200–20 and 100–10 p.p.m.) sprays (a total of 310 gals. per acre) reduced fruit infection on the Homestead variety by 67 and 28 per cent., compared with two untreated plots, and increased total yields by 25 and 10 per cent., respectively. In a second experiment also given seven 200–20 p.p.m. sprays (465 gals.) fruit infection in transplants which were healthy and infected at the start was 85 and 72 per cent. less than in the unsprayed, while healthy transplants sprayed with 100–10 p.p.m. had 74 per cent. less. Cracking and scarring of fruit was reduced in this latter experiment by 40 per cent., but size was unaffected. Picking fruit while the plants were wet with dew markedly increased fruit infection. The cost of the antibiotic at the higher rate was $49.60 per acre for the first experiment and $74.40 for the second.

Briejer (C. J.). **Bacterial wilt in Europe.**—*Commonw. phytopath. News*, 2, 1, p. 5, 1956.

This is a brief note confirming the identification of *Pseudomonas solanacearum* on [tomato] plants in glasshouses in Holland [*R.A.M.*, 34, p. 493].

KRSTIĆ (M.). **Prospects of application of biological control in forest pathology.**—*Bot. Rev.*, **22**, 1, pp. 38–44, 1956.

The author reviews briefly the literature (31 titles) on the possibility of utilizing antagonistic micro-organisms in forest pathology and discusses the prospects of controlling tree pathogens and timber saprophytes by their use.

SOMMER (N. F.). **Sunburn predisposes Walnut trees to branch-wilt.**—*Phytopathology*, **45**, 11, pp. 607–613, 1 fig., 2 graphs, 1955.

At the Department of Plant Pathology, University of California, Davis, normal branches of vigorous walnut trees inoculated with *Hendersonula toruloidea* [*R.A.M.*, **35**, p. 245] sustained little or no damage, whereas extensive cankers developed on those that were even mildly sunburned. Thus, severe injury from branch wilt is restricted to orchards where high summer temperatures (over 90° F.) prevail, e.g., in the southern part of the San Joaquin Valley and the central and northern areas of the Sacramento Valley. Spore germination is dependent on relative humidity above 90 per cent., but the necessary moisture is evidently provided by the host tissues. The application of whitewash effectively prevented the formation of cankers on inoculated branches exposed to the sun, presumably by reducing the extent and severity of the burning which predisposes to infection.

FREZZI (M. J.). **Presencia de 'Botryosphaeria ribis' en la República Argentina y su importancia económica.** [The presence of *Botryosphaeria ribis* in the Argentine Republic and its economic importance.]—*Rev. Invest. agríc., B. Aires*, **6**, 2, pp. 247–262, 10 figs., 1952. [Received February, 1956.]

A survey made in September, 1949, showed that *Botryosphaeria ribis* [*R.A.M.*, **33**, p. 455] was responsible for the death of four- to five-year-old *Chamaecyparis lawsoniana* in the Delta province of Buenos Aires, Argentina, while in August, 1950, it attacked avocado trees at Yacanto, Córdoba province, causing severe cankers and excretions along the trunk and main branches. In addition it caused the death, from root and collar rot, of fully grown *Platanus acerifolia* in March, 1951, in Córdoba province, and of seven- to eight-year-old *Eucalyptus* trees at the Manfredi Experiment Station.

A detailed study is made of the morphology and cultural characters of the pathogen from *C. lawsoniana* and of the imperfect state (*Dothiorella* [? *gregaria*: **32**, p. 670]) on this host and on avocado. Pathogenicity was established by inoculating the stems of two-year-old and the trunks of 12-year-old avocado trees, and those of eight- to nine-year-old *P. acerifolia* and *Eucalyptus* with pure monospore cultures of *B. ribis* or those isolated directly from diseased bark. Agar fragments of the cultures were inserted into incisions which were then covered with moist cotton wool and paper. Symptoms were observed ten days later in avocado seedlings, and after 15 days in *P. acerifolia* and *Eucalyptus*.

In avocado the cankers and all affected tissue on the trunk should be removed and the wounds covered first with 1 in 1,000 mercuric chloride and three or four days later with Bordeaux paste or tar. This treatment applies also to pruning cuts on the larger branches. In badly drained soils exposure of the roots to a depth and width determined by the age and size of the tree, with care to avoid injury, is recommended for *P. acerifolia* and *Eucalyptus* as a preventive of infection.

DOMAŃSKI (S.). **Z badań nad zgniliznami drewna Olszy Czarnej (Alnus glutinosa L. Gaertn.) w odroślowym drzewostanie w Wesołej koło Siemianic.** [Studies on wood rots of Black Alder (*Alnus glutinosa* L. Gaertn.) in a coppice at Wesła near Siemianice.]—*Acta Soc. Bot. Polon.*, **24**, 2, pp. 287–310, 11 figs., 4 graphs, 1955. [English summary.]

Observations on a 51-year-old alder (*Alnus glutinosa*) coppice at Wesła near

Siemianice, Poland, showed that decay incidence corresponded to the height at which the roots originated, trunks in which this occurred at 1 to 1·5 m. above ground being affected by butt rot, which in 77 per cent. of the cases was attributable to four species of fungi. *Polyporus radiatus* was isolated from 56 per cent. of the cases recorded, *Stereum frustulosum* from 7 per cent., and *S. rugosum* [cf. *R.A.M.*, 16, p. 7] and an unidentified fungus, No. 223, each from 6 per cent. Where *P. radiatus* and *S. frustulosum* affected the same trunk, there was a black line in cross-sections of the wood separating the areas infected by the two fungi, and a considerable difference in the extent of decay indicated that the rate of growth of the former was very rapid and of the latter very slow.

Wallace (G. B.) & Wallace (Maud M.). **Sudden death disease of Cashew trees in Tanganyika—a preliminary note.**—*E. Afr. agric. J.*, 21, 1, pp. 42–43, 1955.

Cashew nut trees (*Anacardium occidentale*) growing near Lindi, in the Southern Province of Tanganyika, became affected in 1951 by a disease apparently identical with the 'sudden death' of cloves in Zanzibar caused by *Valsa eugeniae* [*R.A.M.*, 34, p. 63]. Ten cashew trees in a sisal plantation died and were felled; in 1952, 20 to 30 adjacent trees were affected and were stumped, and in 1953 over 100 trees died.

Affected trees develop a rapid yellowing of the leaves, which then russet, as if scorched by fire; this process occurs in ten or 14 days. A fungus isolated from the main root of one affected tree was identified as *Cytonaema* sp. and later found to be indistinguishable from the conidial state of *V. eugeniae*. *Botryodiplodia theobromae* was also frequently isolated, and appeared on cashew chips kept in damp chambers, but it is probably only of secondary importance. As in the clove disease, there is always a certain amount of yellow discoloration present in affected trees, and owing to the similarities described it is suggested that the cashew disease should also be called 'sudden death'. Control is unlikely to be easy. Diseased trees should be destroyed by burning, as a precaution.

Gillespie (W. H.) & True (R. P.). **Progress of Oak wilt in West Virginia.**—*Plant Dis. Reptr*, 39, 10, pp. 783–784, 1955. [Multilithed.]

Since August, 1955, 300 new infection spots of oak wilt (*Endoconidiophora fagacearum*) [*Chalara quercina*: *R.A.M.*, 35, p. 248] have been located in West Virginia, four of which constitute the first known records in Marion, Harrison, Fayette, and Calhoun counties. A partial survey of the State in 1954 revealed a total of only 145 individual trees with oak wilt. The underground spread through natural root grafts [35, p. 54] was more frequent than previously observed and caused greater loss at individual sites in some north-eastern counties than in other parts of the State.

Ark (P. A.) & Charles (F. M.). **Control of Walnut blight.**—*Calif. Agric.*, 10, 3, p. 8, 1956.

Experiments in San Joaquin County, California, have shown that whereas control of walnut blight [*Xanthomonas juglandis*: *R.A.M.*, 32, p. 704] is poor following only one pre-bloom or post-bloom spray, good control is obtainable with one at mid-bloom (40 per cent. open blossoms), and especially with an additional post-bloom spray. Both copper A and streptomycin were effective. The former applied at 3 lb. per 100 gals. gave 92 to 95 per cent. control: the latter at 50 p.p.m. gave 89 per cent. control. Dusts were rather less effective owing to the effect of wind on application. No phytotoxic effects were observed on the blossoms.

Egund (K. F.) & Jørgensen (E.). **Angreb af skimmelsvampe på dampede Bøgeemner, udstabet til lufttørring, og en metode til svampenes bekæmpelse.** [Infection by mould fungi of steamed Beech blocks stacked for air-seasoning and a method for the control of the fungi.]—*Medd. Akad. tekn. Vidensk.* 1, 35 pp., 19 figs., 7 diags., 11 graphs, 1954. [English summary. Received December, 1955.]

A comprehensive survey is given of an inquiry, initiated in 1950 by the Research Committee of the Timber Industry, into the serious problem of fungal damage to beech blocks during air-drying in Denmark. Six sawmills were visited in the course of the investigations.

The most prevalent moulds were *Penicillium* and *Mucor* spp. (including *M. racemosus* and *M. hiemalis*), which leave no traces after seasoning and brushing, and *Cladosporium herbarum*, causing a dark spotting of the surface. By far the best method of prevention is kiln-drying, which is, however, very seldom practicable. In a search for effective and economical preservatives, both borax and oxyquinoline sulphate proved satisfactory in laboratory experiments, but in practice only the latter, at a concentration of 2 per cent., gave results comparable to those obtained with pentachlorophenol, well known for its efficiency. Small amounts of borax, however, were useful in binding the oxyquinoline sulphate to the wood.

The blocks should preferably be stacked in detached sheds open to the outside air; they should not be too long or broad, lightly covered on top, and the sides protected from the sun's rays. The longer the operations of sawing and steaming were delayed between January and the beginning of April, the lower was the percentage of infection. In June, when air temperatures and humidity tend to rise, blocks should be dried below fibre saturation point to prevent heavy damage from moulds. Dipping the blocks in the preservative was more successful than spraying.

Ramaswamy (M. N.). **Sandal spike—a plant virus disease.**—*Indian For.*, 82, 2, pp. 70–73, 1956.

In this brief review of the spike virus disease of sandal (*Santalum album*) in India [*R.A.M.*, 34, p. 751] the author sums up the present position objectively against the background of modern virus research and discusses various methods of study which would ultimately help in the control of the disease.

Lohwag (K.). **Fomes pinicola (Sw.) Cooke = Ungulina marginata (Fr.) Pat., von der Mycelkultur zum Fruchtkörper.** [*Fomes pinicola* (Sw.) Cooke = *Ungulina marginata* (Fr.) Pat., from mycelial culture to fruit body.] *Schweiz. Z. Pilzk.*, 33, 5, pp. 69–74, 1955.

Full details are given of a new culture method which has been used successfully at the Institute for Soil Culture, Vienna, for the production of fruit bodies of *Fomes pinicola*, a pathogen of both soft- and hardwoods in Austria. It consists, briefly, in the use of a medium composed of fairly coarse chips of sawn spruce wood with a small quantity of malt peptone agar in patent glass cooking-vessels, 14 by 9 cm., with an opening 4·5 cm. in diameter and a bakelite screw top. As soon as the mycelium has thoroughly permeated the medium, the vessels are transferred from the incubator to a greenhouse maintained at a temperature suitable for ornamentals. In the course of four months characteristic fruit bodies developed, measuring 34 by 33 by 25 mm. and emitting the typical odour of *F. pinicola*.

Da Costa (E. W. B.). **The use of chemicals in the control of blue stain in Pinus radiata.**—*C.S.I.R.O. For. Prod. News Lett.* 194, pp. 3–4, 7, 3 figs., 1953.

Timber of *Pinus radiata* in Australia may be protected from blue stain [cf. *R.A.M.*, 34, p. 828], due to the attack of various fungi on the sapwood before the timber is properly dried, by dipping freshly sawn boards in a solution consisting

of 5 lb. sodium pentachlorophenate and 15 lb. borax, or 3 lb. sodium pentachlorophenate, 10 lb. borax, and 2 oz. ethyl mercuric phosphate in 100 gals. water. Spraying the timber is less effective.

Rawlings (G. B.). **Epidemics in Pinus radiata forests in New Zealand.**—*N.Z. J. For.*, 7, 2, pp. 53–55, 1955.

In this paper, read at the Eighth New Zealand Science Congress, Auckland, in 1954, the author, in reviewing epidemics in the last 25 years, states that although there are as yet no serious disease outbreaks in forests of *Pinus radiata* in New Zealand, the stands have shown susceptibility to several minor attacks by insects and fungi. The outbreak in 1953 of *Lophodermium pinastri* [*R.A.M.*, 34, p. 267], causing severe defoliation in restricted areas of the Rotorua forests, was mainly due to the preceding two warm, wet winters and a cool, wet summer, which favoured the fungus.

Vörös (J.). **Antibiotikumok és antagonista mikroorganizmusok felhasználása fenyőcsemetedőlés ellen.** [Antibiotics and antagonistic micro-organisms in the control of damping-off of Pine seedlings.]—*Növénytermelés*, 3, 1–2, pp. 115–122, 5 figs., 3 graphs, 1954. [Russian and English summaries.]

In *in vitro* experiments at the Research Institute for Plant Protection, Budapest, Hungary, actidione (1 μg. per ml.) and trichothecin (20 μg. per ml.) [see above, p. 476] inhibited the growth of a *Fusarium* species, which is chiefly responsible for damping-off of black pine (*Pinus nigra*) seedlings [*R.A.M.*, 34, p. 760], but considerably inhibited the germination of pine seeds. Damping-off was reduced by 20 per cent. in sterile sand artificially infested and moistened with actidione culture fluid (0·5 μg. per ml.), but in unsterilized soil the phytotoxic action and decomposition of the antibiotics nullified their use as control agents.

Morrison (F. T.). **Nursery propagation of Kauri at Waipoua Forest.**—*N.Z. J. For.*, 7, 2, pp. 42–52, 1955.

A *Fusarium* sp. causing damping-off of kauri [*Agathis australis*] seedlings in New Zealand, has on occasion been serious at the Waipoua Forest Nursery during humid winter weather. An application of a very dilute solution of potassium permanganate in the early stages of attack destroyed the fungus. A heavy attack of a *Pestalozzia* sp., following the humid winter of 1952 with high air temperatures, was recorded both in the Nursery, where it caused leaf collapse in kauri stocks of all ages, and on seedlings and saplings in the forest. Permanent damage was prevented by a cold spell.

Grasso (V.). **Un nuovo ospite del Coryneum cardinale Wag. in Italia.** [A new host of *Coryneum cardinale* Wag. in Italy.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 12 (*1954*), pp. 209–211, 1 fig., 1955.

The author recently found a small plant of *Cupressus lusitanica* var. *bentami* growing near Florence, the stem of which was seriously infected by *Coryneum cardinale* [*R.A.M.*, 30, p. 352]. The disease appears to be spreading in Italy.

Nobles (Mildred K.). **Studies in wood-inhabiting Hymenomycetes. III. Stereum pini and species of Peniophora sect. Coloratae on conifers in Canada.**—*Canad. J. Bot.*, 34, 1, pp. 104–130, 1 pl., 64 figs., 3 diags., 1956.

In this further contribution [cf. *R.A.M.*, 34, p. 759] it is stated that the section Coloratae of *Peniophora* [32, p. 349] is represented in Canada only by *P. septentrionalis* associated with a red stain and white rot of spruce (*Picea* spp.), *P. pithya* on *Larix laricina* and *Picea* spp., a new record for North America, and *P. separans* on various conifers, collected only twice previously in 1921. Descriptions of the

sporophores, cultural characteristics, results of interfertility tests, and geographical distribution are given for these species and for *Stereum pini* [32, p. 664], associated with a red stain and white rot of pine, and for an undetermined fungus T from a sap rot in *Pinus banksiana*. Also given is an auxiliary key for the identification of cultures of wood-rotting fungi [28, p. 201].

Strong (F. C.) & Klomparens (W.). **The control of Red Cedar-Apple and Hawthorn rusts with acti-dione.**—*Plant Dis. Reptr*, 39, 7, p. 569, 1955. [Multilithed.]

In trials carried out by the Department of Botany and Plant Pathology, Michigan State College, and the Upjohn Company, Kalamazoo, a single application of actidione (100 p.p.m. in water or 50 and 25 p.p.m. in 0·5 per cent. casco summer oil) to the galls on red cedar (*Juniper virginiana*) in the spring prevented the germination of the teleutospores of *Gymnosporangium juniperi-virginianae* and *G. globosum* [*R.A.M.*, 33, p. 431].

Gregory (P. H.), Hirst (J. M.), & Last (F. T.). **Concentrations of basidiospores of dry rot fungus (Merulius lacrymans) in the air of buildings.**—*Acta allerg. Kbh.*, 6, pp. 168–174, 1 graph, 1953. [Received 1955.]

During 1952 the air in a condemned bomb-damaged house in London was sampled with the cascade impactor [*R.A.M.*, 31, p. 618] and the automatic volumetric spore trap [loc. cit.]. Concentrations of *Merulius lacrymans* spores in the air ranged from 79,500 per cu. m. in a cellar with active fruit-bodies to 16,000 in a room without fruit-bodies. In a country house, sampled similarly, with active fruit-bodies in both places, the concentrations were 360,000 and 1,630 spores, respectively. In an old unaffected cottage no spores of the dry rot fungus were found, and less than 10 per cu. m. of any other species.

Findlay (W. P. K.). **Influence of sample size on decay rate of wood in culture.**—*Timb. Technol.*, 61, pp. 160–162, 1 graph, 1953. [Received 1955.]

At the Forest Products Research Laboratory, Princes Risborough, during laboratory tests of the natural durability of timber [*R.A.M.*, 20, p. 142], further experiments [31, p. 262] have shown that the amount of decay measurable by percentage loss in dry weight of the test block increased as the volume of the block was reduced. Test pieces of oak heartwood 10 by 2·5 by 1·25 cm. lost 6·3 per cent. after 16 weeks' exposure to infection by *Phellinus cryptarum*, compared with 26·2 per cent. in blocks 5 by 2·5 by 0·18 cm. For Scots pine infected over the same period by *Lentinus lepideus* the losses were 5·1 and 20·3 per cent. It is probable that the rate of decay is controlled by the rates at which carbon dioxide diffuses out of and oxygen into the wood. It is suggested that to investigate the durability of highly resistant timbers very thin test pieces should be employed in order to obtain measurable weight losses.

Decay studies in wooden boats and ships.—*Rep. U.S. Dep. Agric., Div. For. Path.*, NPO 15475 and 19826, 33+3 [unnumbered] pp., 12 pl., 1953. [Mimeographed. Received October 1955.]

In this report, prepared jointly by the Division of Forest Pathology, United States Department of Agriculture, and the Bureau of Ships, Navy Department, the decay [unspecified] found in a sample of 550 small boats [cf. *R.A.M.*, 33, p. 392; 34, p. 562] is analysed and suggestions made for its prevention, including adequate ventilation and the use of seasoned and preservative-treated timber.

Kimura (K.). **On the polarity of some wood-destroying fungi. I.**—*Biol. J. Okayama Univ.*, 1, 3, pp. 157–162, 1953. [Received 1955.]

The polarity of seven species of wood-destroying fungi [*R.A.M.*, 34, p. 825] was

determined at the Department of Biology, Okayama University, Japan. All were heterothallic; *Trametes vittata* was bipolar, while *Lentinus tigrinus*, *Polystictus abietinus*, *Lenzites betulina*, *Steccherinum* [*Hydnum*] *ochraceum*, *Claudopus nidulans*, and *Coriolus* [*P.*] *hirsutus* were tetrapolar.

Van der Westhuizen (G. C. A.). **Some common woodrotting fungi.**—*Fmg. in S. Afr.*, 30, 356, pp. 485–487, 4 figs., 1955.

The most common decay fungi attacking living trees, fence posts, and stored timber in South Africa are *Stereum hirsutum*, *Trametes* [*Polystictus*] *proteus*, *Polyporus* [*Polystictus*] *cinnabarinus*, and *Schizophyllum commune*; the macroscopic features of each are described. Preventive treatment with a suitable preservative is recommended [cf. *R.A.M.*, 28, p. 102; 34, p. 421].

Gustafsson (C.) & Gadd (O.). **Formalin for prevention of rot and mould growth in wet pulp.**—*Paperi ja Puu*, 36, 4, pp. 155–156, 1954.

Investigations carried out in Finland, partly on miniature bales of mechanical pulp and partly on mill-made bales of mechanical and chemical pulp [*R.A.M.*, 34, p. 560], showed that the addition of 3,000 gm. of a 40 per cent. formalin solution per ton of wet pulp gave satisfactory protection against fungal attacks (*Penicillium*, *Pullularia*, *Stemphylium*, and *Polyporus* in the miniature bales) for three to eight months, depending on the storage temperature.

Hemmi (T.) & Ishigami (K.). **Ecological studies on Alternaria circinans causing leaf-spot and browning of Cabbage and Cauliflower.**—*Bull. Univ. Naniwa*, Ser. B, 3, pp. 93–104, 1 fig., 1953. [Japanese, with English summary. Received October, 1955.]

In studies at the Department of Agriculture, Naniwa University, Japan, *Alternaria circinans* [*A. brassicicola*: *R.A.M.*, 28, p. 248], the agent of leaf spot of cabbage and cauliflower, and of browning and rot of cauliflower heads, grew in culture between 10° and 36° C. with an optimum at 26°, while the optimum for conidial germination was about 34°, the same temperature at which the pathogen was most susceptible to copper sulphate. Resistance to copper sulphate decreased until the 35th day in culture, but increased after this.

Kole (A. P.) & Philipsen (P. J. J.). **Physiologische specialisatie bij Plasmodiophora brassicae.** [Physiologic specialization in *Plasmodiophora brassicae*.]—Abs. in *Tijdschr. PlZiekt.*, 62, 1, p. 24, 1956.

The results of cross-inoculation experiments with two isolates of *Plasmodiophora brassicae* [*R.A.M.*, 35, p. 136], one from cauliflower in North Holland and the other from swede [32, p. 227] in the Veluwe, showed that the former host sustained equally heavy damage from both strains, whereas the latter was severely attacked only by its own strain. Evidently, therefore, the isolates belong to different physiologic races of the fungus, as many as possible of which should be used in the inoculation of plots for the assay of resistance to club root.

Mackinnon (J. P.). **A virus latent in Turnips.**—*Canad. J. Bot.*, 34, 1, pp. 131–134, 1 pl., 1956.

At the Plant Pathology Laboratory, Fredericton, New Brunswick, *Myzus persicae* reared on turnip plants transmitted a virus quite distinct from potato leaf roll virus when transferred to *Physalis floridana* during routine leaf roll investigations. This virus, designated turnip-latent virus, induced vein yellowing on *P. floridana*, severe stunting and chlorosis on *Nicandra physaloides*, slight stunting on several *Brassica* species, and was symptomless on turnip and rutabaga [swede]. The virus was not transmitted mechanically; it was acquired by *M. persicae* after

seven hours' feeding and transmitted approximately 23 hours later during a one-hour feeding period.

The occurrence of a latent virus in certain species of *Brassica* is of interest owing to the frequent use of some of these for rearing aphids used in virus transmission studies. In a footnote the author indicates that this virus appears to be the same as the yellow net virus of certain Solanaceae recently found in Maine [*R.A.M.*, 35, p. 273].

Lentz (P. L.). **A scurf of Sugar Beets caused by Cylindrocladium scoparium.**—*Plant Dis. Reptr*, 39, 8, pp. 654–655, 2 figs., 1955. [Multilithed.]

Cylindrocladium scoparium, a weak pathogen on various plants [cf. *R.A.M.*, 34, p. 138], was identified at the Agricultural Research Service, Beltsville, Maryland, as the pathogen responsible for the scurf of sugar beets, first observed at Arlington Farm, Virginia, in 1935 and again at Blissfield, Michigan, in 1947, in which the root crown became brown and cracked and the petioles withered. Culture studies and inoculation experiments showed the fungus to be a weak pathogen on sugar beet.

Keller (E. R.). **Sortenversuchen mit Futterrüben.** [Varietal trials with Fodder Beets.]—*Mitt. schweiz. Landw.*, 4, 1, pp. 6–13, 7 figs., 1956.

Included in this report on the varietal trials of introduced fodder beets, conducted at the Federal Agricultural Experiment Station, Zürich-Oerlikon, Switzerland, from 1952 to 1954, inclusive, are notes on their reactions to the leaf diseases caused by *Cercospora* [*beticola*: *R.A.M.*, 33, p. 207] and *Ramularia* [*beticola*: 29, p. 201]. Of the eight varieties tested, three were rated as resistant to *C. beticola*, i.e., Eureka, Regia, and Weisse Strynø. Slight to moderate susceptibility was shown by Ursus, Grünköpfige Halbzucker Buszcynski, Peragis, and Bartošova, while Rosa Beta was graded as susceptible. In a large-scale outbreak of *R. beticola* in 1954 Eureka, Regia, and Weisse Strynø suffered distinctly less than the other varieties.

Archimovich (A.). **Selective breeding of Sugar-Beets in Russia and the U.S.S.R.** —*Bot. Rev.*, 22, 1, pp. 1–37, 1956.

This review (from 88 references to the literature) of the work done on selective breeding of sugar beets in the U.S.S.R. includes a short paragraph on the study of pests and diseases and one on breeding for resistance to fungus diseases. Root rot (*Phoma betae*) [*R.A.M.*, 34, p. 763], leaf spot (*Cercospora beticola*) [25, p. 380], and storage rot (*Botrytis cinerea*) [33, p. 7] are the most widespread.

Bercks (R.) & Zimmer (K.). **Untersuchungen über die viröse Rübenvergilbung.** [Studies on Beet yellows virus.]—*Phytopath. Z.*, 25, 3, pp. 255–266, 4 figs., 2 graphs, 1956.

In further studies at the Institute for Virus Serology, Braunschweig-Gliesmarode, Germany, the isolate of beet yellows virus previously subjected to electron-microscopic examination [*R.A.M.*, 35, p. 138] was transmitted by *Myzodes* [*Myzus*] *persicae* to a number of hosts, including (besides those already mentioned) fodder and red beets, mangold, seven species of *Chenopodium*, *Atriplex hortense*, *Amaranthus gangeticus*, *A. retroflexus*, and *Gomphrena globosa*. The symptoms induced on primary and successive beet leaves varied considerably and comprised, *inter alia*, vein-clearing, brown to scarlet, later necrotic dots, especially near the apex, and persistent, punctiform clearings in the interveinal areas. On the other hosts the symptoms were characteristic and constant. The virus was also transmissible by grafting.

An antiserum was prepared from inoculated leaves of *Tetragonia expansa* and a method of serological diagnosis developed. In the course of this work it was

observed that at 37° and 30° C. the sap of diseased leaves flocculated spontaneously without the addition of antiserum. By the application of serological procedures the thermal death point of the virus from sugar beet and *T. expansa* was shown to lie between 50° and 54° (mean 52·5°). Uncentrifuged sap from both sources retained its activity for at least 20 days at 3°, whereas that of centrifuged was lost between the 15th and 20th day. At room temperature longevity in both cases was limited to four or five days. When the hydrogen-ion concentration of centrifuged sap from *T. expansa* with a pH of 5·7 to 6 was adjusted either upwards or downwards its activity decreased, especially in the acid direction, and at 5 to 8 inactivation was complete.

Wallen (V. R.). **The effect of storage for several years on the viability of Ascochyta pisi in Pea seed and on the germination of the seed and emergence.**—*Plant Dis. Reptr*, 39, 9, pp. 674–677, 1955. [Multilithed.]

At the Botany and Plant Pathology Laboratory, Canada Department of Agriculture, Ottawa, 18 samples of two- to 13-year-old pea seed were tested for seed-borne infection of *Ascochyta pisi* [*R.A.M.*, 34, p. 200; 35, p. 63]. The infection was found to be eliminated without significant loss of germinative capacity of the seed or lack of emergence of seedlings in most varieties that had been stored for seven years, indicating that such a storage period may constitute a practical means of controlling seed-borne infections from this disease.

Wolf (E. A.) & Hills (W. A.). **Seminole—a new disease-resistant, green, round-podded Bush Bean.**—*Circ. Fla agric. Exp. Sta.* S–73, 6 pp., 2 figs., 1954. [Received January, 1956.]

The release of the Seminole bush bean [*Phaseolus vulgaris*] has already been noticed from another source [*R.A.M.*, 32, p. 602].

Ditman (L. P.), Cox (C. E.), & Kantzes (J. G.). **Treatment of Pea, Snap Bean, and Lima Bean seed with insecticides and fungicides.**—*J. econ. Ent.*, 48, 6, pp. 689–693, 2 figs., 1955.

A tabulated survey is given of the data obtained in trials at the Maryland Agricultural Experiment Station in 1953 and 1954 on the combined insecticidal and fungicidal seed treatment of Thomas Laxton and Pride pea, Top Crop snap bean [*Phaseolus vulgaris*], and Fordhook Lima bean [*P. lunatus*], using the slurry method throughout. The results were extremely variable, depending primarily on temperature and soil moisture, variety and vitality of the seed, and the microbiological population of the soil. In cold, wet soils, which are highly unfavourable to seed germination, or in the warm, moist ones which expedite this process, little benefit accrued from the treatments, but between these extremes the response was excellent. The performance of captan and thiram was more satisfactory than that of chloranil. There was some indication that lindane stimulated fungal growth (probably *Pythium* sp.) over the seed.

Ghani Arif (A.) & Munjal (R. L.). **The causal fungi of the blight disease of Phaseolus in the Punjab.**—*Pakistan J. sci. Res.*, 7, 3, pp. 83–92, 1 fig., 3 graphs, 1955.

Full descriptions are given of two fungi causing heavy damage to *Phaseolus radiatus* and *P. mungo*, important pulse crops in the submountainous regions of the Punjab, with a critical discussion of their taxonomy. On the basis of cultural studies and inoculation experiments one was identified as *Phyllosticta phaseolina* [*R.A.M.*, 16, p. 655] (with which *P. phaseolorum* [13, p. 804] is considered to be synonymous) and the other as *Ascochyta phaseolorum* [6, p. 715; 9, p. 274].

Faulkner (L. R.) & Seliskar (C. E.). **The nature of secondary infection in bacterial wilt of Bean caused by Corynebacterium flaccumfaciens (Hedges) Dowson.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 6, p. 50, 1954.

In inoculation experiments at the Colorado A & M College with *Corynebacterium flaccumfaciens* on Pinto III bean [*Phaseolus vulgaris*] plants [*R.A.M.*, 32, p. 5] the pathogen was shown to be capable of entering through the root system, previous injury to which (and also to the stem and leaf tissues) materially increased the incidence of infection. Bacterial wilt is stated to be increasing in importance annually in the State, necessitating intensive investigations on its mode of invasion and spread in the field.

Skotland (C. B.). **A Phytophthora damping-off disease of Soybean.**—*Plant Dis. Reptr*, 39, 9, pp. 682–683, 1 fig., 1955. [Multilithed.]

A species of *Phytophthora*, stated to resemble *P. cactorum*, was isolated with other fungi from damped-off Ogden soy-bean seedlings in two widely separated areas in North Carolina in 1954. The fungus, not previously reported as causing damping-off of soy-beans [cf. *R.A.M.*, 35, p. 267], produced typical symptoms and its oospores were common in infected host tissues. In pathogenicity trials, using Ogden soy-beans and inoculum prepared from the fungus grown on sterilized soy-bean seeds in water for six to eight days at 25° C., the fungus caused both pre- and post-emergence damping-off at 18°, 24°, and 27° to 30°. The sporangia were non-papillate and proliferated internally [in both these characters differing from *P. cactorum*].

Gray (R. A.). **Increasing the effectiveness of streptomycin against the common blight of Beans with glycerin.**—*Plant Dis. Reptr*, 39, 7, pp. 567–568, 1955. [Multilithed.]

In greenhouse tests at the Research Laboratories, Chemical Division, Merck & Co., Inc., Rahway, New Jersey, the addition of 1 per cent. glycerin to streptomycin sprays greatly increased the effectiveness of the antibiotic against bacterial blight (*Xanthomonas phaseoli*) of Pinto beans [*Phaseolus vulgaris*: *R.A.M.*, 33, p. 574]. When the spray was washed off the surface of the leaves before inoculation, as if by rain, 50 p.p.m. streptomycin sulphate plus glycerin was much more effective than 200 p.p.m. streptomycin used alone, while 200 p.p.m. streptomycin plus glycerin gave almost complete protection. This increase in effectiveness was correlated with an increase in absorption of streptomycin by the leaves.

Agnihothrudu (V.). **Incidence of fungistatic organisms in the rhizosphere of Pigeon-Pea (Cajanus cajan) in relation to resistance and susceptibility to wilt caused by Fusarium udum Butler.**—*Naturwissenschaften*, 42, 12, pp. 1–2, 1955.

A study was made at the University Botany Laboratory, Madras, India, of the distribution of fungistatic organisms in the rhizospheres of pigeon-pea plants, both resistant and susceptible to *Fusarium udum* [*R.A.M.*, 35, pp. 232, 281, 326], growing in seven different soils. Actinomycete colonies, including *Streptomyces griseolus* which was the most abundant and highly inhibitory to *F. udum*, *S. erythrochromogenus* and an unidentified species which were also inhibitory, and species of *Nocardia* and *Micromonospora*, both of which induced very little inhibition, were obtained in dilutions from the rhizosphere of resistant plants. Actinomycetes thus isolated exerted maximum inhibition of *F. udum* on a medium prepared with root extracts of the resistant strain, but were only weakly antagonistic on root extract medium of the susceptible strain. *F. udum* survived for shorter periods in the rhizosphere soil of resistant plants than of susceptible.

Singh (R. S.) & Sinha (R. P.). **Studies on the wilt disease of Cowpea in Uttar Pradesh. I. Occurrence and symptoms of the disease and identity of the causal organism.**—*J. Indian bot. Soc.*, 34, 4, pp. 375–381, 6 figs., 1 graph, 1955.

The *Fusarium* causing the wilt of cowpea recently reported from Uttar Pradesh

[*R.A.M.*, 33, p. 517] has now been identified as *F. oxysporum* [*F. bulbigenum* var.] *tracheiphilum* [29, p. 453]. On young plants and sometimes on varieties with a short, strong stem, such as Lobia Type 1, the pathogen causes a sudden, outright wilting of the whole plant. In mature plants the wilt is often preceded by a yellowing of the leaves, which soon wither, leaving a dry, naked stem. Occasionally the apex of a branch dries, together with the pods on it, while the lower portion of the plant remains green or yellowish-green. In some varieties with a weak and climbing stem there is a gradual drying of the stem and leaves from the top downwards, the wilt taking two or three weeks to reach the base.

In pathogenicity tests on potted Lobia Type 1 plants the disease appeared earliest when the roots were pruned and dipped in a spore suspension of the fungus. The organism was selectively pathogenic to cowpea out of a number of legumes inoculated.

HARRISON (D. E.). **Onion white rot—further control experiments.**—*J. Agric., Vict.* (formerly *J. Dep. Agric. Vict.*), 54, 1, pp. 17–20, 1956.

In view of the results of earlier experiments in which calomel [mercurous chloride] was recommended for the control of onion white rot (*Sclerotium cepivorum*) in Victoria [*R.A.M.*, 34, p. 202] two separate field trials were conducted during the 1954–5 season at Coragulac on a portion of the land most heavily infected in the Colac area. The seed was sown on 24th May, 1954, the total number of onions counted on 2nd September, and the percentage of healthy ones estimated on 10th January, 1955. In the first trial the calomel seed-pelleting method (2 lb. to 1 lb. seed with resin sticker) gave 35·6 per cent. healthy onions, and seed not receiving calomel 11 per cent. Lime or copper sulphate gave no significant improvement. In the second trial the percentages of healthy onions were 4·3 in the control, 9·8 for urea applied before planting, 39·6 for mercuric chloride, and 20·6 in the Calred variety, a red onion reported to develop less white rot in bad areas. The highly significant control of the disease in the two last-named plots was accompanied by yields of 54·2 and 33·5 lb. [per plot], respectively, compared with 8·2 for the control. Unfortunately the mercuric chloride treatment is suitable only for small areas owing to the high cost. Calomel-pelleting, however, is much easier to apply and is fairly economical. Analysis of samples from the mercury-treated plots revealed no danger of toxicity to humans.

In a small trial at Heatherton in the metropolitan market garden area onion transplants were treated on 28th April, 1954, with calomel paste as recommended by the British Ministry of Agriculture (*Adv. Leafl. Minist. Agric. Fish., Lond.*, 62, 1949) but using approximately twice as much water to make a thinner paste. The results on 15th October were 95·5 per cent. healthy onions in the treated plots and 81·3 in the untreated. The cost is approximately 5s. per 1,000 plants.

GUBA (E. F.). **Leaf spot of Parsnip caused by the fungus Cercosporella pastinacae Karst.**—*Plant Dis. Reptr*, 39, 10, pp. 747–748, 1955. [Multilithed.]

After reviewing the relevant literature and examining herbarium material of parsnip from many sources and living specimens from Massachusetts, the author notes that in the *Cercosporella* leaf spot disease *Cercosporella* and *Ramularia* spores are often in constant association [*R.A.M.*, 24, p. 5]. He supports the view of Conners and Saville [loc. cit.] that only one fungus is involved and suggests that the original name *C. pastinacae* should be retained. The names *R. pastinacae* and *Cercospora pastinacina* are regarded as synonyms of this.

JACKS (H.). **Screening tests with fungicides for control of Celery leaf spot (Septoria apii Chester).**—*N.Z. J. Sci. Tech.*, Sect. A, 37, 4, pp. 373–378, 1955.

Greenhouse trials were carried out by the Plant Diseases Division, Auckland,

New Zealand, for the control of celery leaf spot (*Septoria apii*) [*R.A.M.*, 32, p. 656]. Eight-week-old celery seedlings were sprayed (five plants per treatment) with 100 ml. of fungicidal suspensions, dusts being applied at the maximum amount that plants would retain; 24 hours later they were inoculated with an aqueous spore suspension of *S. apii* from infected plants. Of the 30 fungicides tested the following were the most effective; ferbam at 0·28 per cent. (fermspray at 0·4 and fertram at 0·35 per cent.); zineb at 0·138 (tank formulation of dithane D-14, nabam at 0·038 plus zinc sulphate at 0·1); maneb at 0·14 (manzate at 0·2); dichlone at 0·013 (phygon XL at 0·025); captan at 0·1 (flit 406 and orthocide at 0·2); dinitrobenzene at 0·075 (nirit at 0·5); and dinitro phenyl crotonate at 0·05 (karathane at 0·2).

The resistance to rain of successful treatments was tested 24 hours after treatment by spraying the plants for six minutes on a turntable with water equivalent to 1 in. rainfall. Ferbam and dichlone as above and zineb in a tank mixture formulation of nabam at 0·038 per cent. plus zinc sulphate at 0·1 (dithane D-14 at 0·2 plus zinc sulphate at 0·1 plus hydrated lime at 0·05), effectively prevented infection under these conditions.

Ullrich (J.). **Die Samenübertragung des Salatmosaiks und ihre Bedeutung für den Salatsamenbau.** [The seed transmission of Lettuce mosaic and its importance in seed Lettuce cultivation.]—*Züchter*, 26, 1–2, pp. 25–27, 2 figs., 1956.

Further studies on the transmission of lettuce mosaic virus through the seed are reported from the Neuss-Lauvenburg branch of the German Biological Institute [*R.A.M.*, 34, p. 273]. Of 38 samples of 10 varieties examined, 16 (42 per cent.) were virus-free, while the incidence of infection in the remainder ranged from 0·1 to 2·3 per cent. [cf. 34, p. 569]. There was no definite indication of differences in varietal reaction. The importance of even a small proportion of infected seed was shown by the fact that initial infections of 0·1, 0·2, 0·72, and 1·16 per cent. resulted in 4·9, 5·1, 33·9, and 57·6 per cent. mosaic, respectively, at harvest time. In practice, however, spread from field to field is the main cause of the increase of infection during the growing season; for example, one stand raised from virus-free seed showed 80 per cent. mosaic in September.

Louvet (J.). **Essai de traitements du sol contre Sclerotinia minor Jagger agent de la pourriture du collet des Laitues.** [Trial of soil treatments against *Sclerotinia minor* Jagger agent of the collar rot of Lettuces.]—*Phytiatrie-Phytopharm.*, 4, 3, pp. 127–130, 1955.

In France *Sclerotinia minor* causes damage to lettuce crops [*R.A.M.*, 17, p. 369], particularly in Roussillon, the Paris area, the Loire valley, and Alsace. In trials in a market garden at Nantes three minutes' steam sterilization of artificially infested soil in the open field increased the percentage of healthy plants on 14th April from 3 (untreated) to 80, but failed to control *Botrytis cinerea*. Twenty per cent. pentachloronitrobenzene at 40 gm. per sq. m. and 3 per cent. tetrachloronitrobenzene [tecnazene] (100 gm.) were active against both diseases, with 55 and 53 per cent. plants, respectively, free from *S. minor*, and the latter was the most effective treatment for lettuces under frames (71 per cent. healthy plants, with none in the untreated).

Bervillé (P.) & Lherault (P.). **Un Oïdium parasite de l'Artichaut, dans le Languedoc.** [An *Oidium* parasitic on Artichoke in Languedoc.]—*Rev. hort., Paris*, 128, 2210, pp. 1422–1423, 1 fig., 1956.

In August, 1955, artichokes growing in the hilly region of Languedoc, to the east of Montpellier, developed wilting due to *Leveillula taurica* [C.M.I. map No. 217; cf. *R.A.M.*, 32, p. 536]. It was present in every artichoke planting in the locality and was also found in Rousillon and Var, production being appreciably reduced in some instances.

Comparative spraying tests showed that copper is effective, but may cause burning if applied in large quantities when atmospheric humidity is high. Applications of 1 per cent. Bordeaux or 0·5 per cent. copper oxychloride, both with the addition of 0·5 per cent. micronized sulphur, are suggested for September. Treatment should be preventive and should begin when moisture conditions become favourable to the parasite. Further spraying tests are to be made in 1956.

Staffeldt (E. E.) & Leyendecker (P. J.). **Verticillium wilt on two vegetable hosts in southern New Mexico.**—*Plant Dis. Reptr*, 39, 7, pp. 589–590, 1 fig., 1955. [Multilithed.]

In 1954 *Verticillium albo-atrum* caused a 75 per cent. loss in a 4-acre commercial planting of okra [*Hibiscus esculentus*] (*Plant Dis. Reptr*, 29, p. 654, 1945) and one of 95 to 98 per cent. in a 3½-acre eggplant field [*R.A.M.*, 32, p. 339] in southern New Mexico. Although okra is regarded as very susceptible, reports of heavy losses from disease are rare. Early and mid-season infection of this host was characterized by severe stunting, while on eggplant stunting, leaf mottling, and defoliation occurred.

Rosa (M.). **La produzione delle Melanzane con fumigazione al terreno.** [The production of Eggplants with soil fumigation.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 12 (*1954*), pp. 35–41, 2 figs., 1 graph, 1955.

In a replicated experiment at Scafati, near Salerno, Italy, plots of eggplant seedlings of the variety Lunga violetta precoce di Napoli were given three different forms of fumigation with chloropicrin [cf. *R.A.M.*, 34, p. 407] at 4 ml. per hole: (*a*) 'total', with holes 17 cm. deep and 30 cm. apart, arranged chequer-board fashion over the whole plot (7 by 3·5 m.); (*b*) 'double row', holes 20 cm. deep and 15 cm. to right and left of each row and 30 cm. apart lengthwise, the plants being 40 cm. apart; and (*c*) 'single row', holes 20 cm. deep 30 cm. apart along each row. The treatments were made by soil injectors of the 'Fumigum' and 'Germain Foudrier' types.

The total productions for the three treatments and an untreated plot, respectively, were 958·3, 808·2, 714·9, and 539·7 kg. The corresponding figures for the incidence of tracheomycosis (mainly due to *Verticillium albo-atrum* were 17·9, 40·8, 66·3, and 89 per cent. It is concluded that, all factors considered, the 'total' treatment was the most economic.

Cox (R. S.). **Compatibility between streptomycin and copper in the control of bacterial spot of Pepper.**—*Plant Dis. Reptr*, 39, 8, p. 616, 1955. [Multilithed.]

At the Everglades Experiment Station, University of Florida, Belle Glade, weekly applications of streptomycin formulations against bacterial spot (*Xanthomonas vesicatoria*) on [chilli] pepper [*R.A.M.*, 35, p. 413] in a dosage series of 100 to 1,000 p.p.m. showed 200 p.p.m. to be the minimum effective dose and 400 p.p.m. the optimum and resulted in yield increases as much as 50 per cent. more than the controls. Tri-basic copper sulphate and copper A also gave effective control and were compatible with streptomycin, considerable additive effect being obtained when they were used in combination (2 to 4 lb. neutral copper with 100 to 200 p.p.m. streptomycin).

Martin (W. J.), Horn (N. L.), & Cox (J. A.). **Fumigation of Bell Pepper seed beds for controlling damping-off caused by Rhizoctonia solani.**—*Plant Dis. Reptr*, 39, 9, pp. 678–681, 1 fig., 1955. [Multilithed.]

In experiments by the Louisiana State University, Baton Rouge, dowfume MC-2 effectively controlled damping-off in bell pepper [chilli] due to *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, 34, p. 126] and destroyed the weeds at less cost than that of labour for weeding: 1 lb. per 100 sq. ft. gave as good control as 2 lb., and only once, for reasons not quite clear, were phytotoxic effects observed.

Panjan (M.) & Prpić (Zdenka). **O jednoj varijanti mozaika Duhana izoliranog iz Paprike.** [On a strain of Tobacco mosaic virus isolated from Pepper.]—*Arh. poljopr. Nauk* [*Trans. Inst. Agron. Res.*], 8, 19, pp. 3–10, 6 figs., 1955. [English summary.]

At the Institute for Plant Protection, Zagreb, Yugoslavia, a strain of tobacco mosaic virus was found to be responsible for a disease of [chilli] pepper plants [cf. *R.A.M.*, 34, p. 426] growing in the vicinity of Zagreb. Electron micrographs of infected tobacco sap showed that the particles of the pepper strain occurred in greater concentrations than those of ordinary tobacco mosaic virus but there was no morphological difference between them.

Boelema (B. H.). **Anthracnose in Watermelons.**—*Fmg in S. Afr.*, 30, 355, pp. 444, 452, 1 fig., 1955.

The author describes the symptoms of and factors favouring infection of watermelons by anthracnose (*Colletotrichum lagenarium*), which is now a serious disease in South Africa, particularly in the Transvaal but also in Cape Province [C.M.I. map No. 313]. The varieties Congo, Sugarstick, and Hawkesbury possess some resistance but are of poorer commercial quality than the highly susceptible Cape Mountain Sweet and Tom Watson.

Control may be secured by planting resistant varieties on well-drained soil at such a time that the growing period does not coincide with the period of heaviest rainfall, and employing a rotation to exclude other cucurbits. In experiments from 1953–5 at the Horticultural Research Station, Pretoria, zineb as a spray or dust [*R.A.M.*, 32, p. 299], captan, and thiram applied weekly at the recommended commercial rates from the time the first symptoms appeared gave satisfactory control.

Bukowski (T.). **Wpływ dwuchlorku etylenu $C_2H_4Cl_2$ na przyspieszenie kiełkowania zarodników Pieczarki.** [The influence of ethylene bichloride ($C_2H_4Cl_2$) on the acceleration of the germination of the spores of the edible Mushroom.]—*Acta microbiol. polon.*, 3, 4, pp. 395–397, 1954. [Russian and English summaries.]

Studies in Warsaw, Poland, showed that ethylene bichloride has a stimulating effect on spore germination of *Agaricus hortensis* [*A. bisporus*]. A five minutes' exposure resulted in germination eight days later, while a three-hour exposure was lethal.

Noordam (D.). **Onkruiden en de verspreiding van virusziekten.** [Weeds and the spread of virus diseases.]—*Meded. Dir. Tuinb.*, 18, 8–9, pp. 639–645, 1955. [English summary.]

This is a survey, based largely on eight contributions to the literature, of the function of weeds in the spread of viroses of horticultural crops. Most of the studies referred to have been noticed from time to time in this *Review*.

Food investigation.—*Rep. Fd Invest. Bd, Lond., 1954*, 72 pp., 1955.

In this publication [cf. *R.A.M.*, 34, p. 653] E. C. Bate-Smith reports (pp. 13–23) from the Low Temperature Research Station, Cambridge, on studies of the large-scale growth of edible higher fungi in deep culture as a contribution to food supplies. In trials to find suitable fungi *Pleurotus ostreatus* [33, p. 127] and *Coprinus comatus* [34, p. 624] grew well and had a suitable flavour after harvest and processing.

R. G. Tomkins reports (pp. 51–59) from the Ditton Laboratory, Kent, on investigation of superficial scald of Edward VII apples in store [cf. 35, p. 462]. Correlation was indicated between the amount of sunshine and rainfall at the end of August

and beginning of September and the development of scald six months after picking. Scald, which is more variable and more severe on air- than on gas-stored apples, was worst on the latter subsequent to long periods of sunshine with little rain. Scalded areas of Edward VII and Bramley's Seedling have fewer open lenticels than uninjured areas, but ethylene treatment can induce scald on fruits with many lenticels. Delay between harvest and cooling must be minimized, or the use of oiled wraps may increase rather than decrease scald in storage. There was some evidence that ethyl butyrate induces scald; added daily to stored apples at 20 mg. to 1,000 kg. fruit it is completely absorbed [cf. 33, p. 608].

Further work on storage rots due to *Gloeosporium* [*Neofabraea*] *perennans* and allied species showed that tree infections produce spores throughout the year, given damp conditions and a high enough temperature, so that autumn and winter pruning cuts may sometimes become infected and be a source of fruit contamination. Spraying in August and September with ziram or S.R. 406 (orthocide) [captan] somewhat reduced rotting in stored fruit. Various cracks in fruit, in addition to lenticels, may give entry to these fungi, and sometimes severe attacks of *G. album* originate from such. Some types of fruit are apparently resistant to the fungus, but other cases of good keeping were attributable to lack of infection rather than to resistance.

Sibilia (C.). **Rassegna dei casi fitopatologici più notevoli osservati nel 1953.** [Review of the most noteworthy phytopathological records observed in 1953.] —*Boll. Staz. Pat. veg. Roma*, Ser. 3, 12 (*1954*), pp. 221–239, 1955.

This report from Italy [cf. *R.A.M.*, 34, p. 346; 35, p. 91] contains, *inter alia*, the following items of information. Vines in the vicinity of Genoa showed severe and widespread infection of the branches by *Phomopsis viticola* [25, p. 492]; the Regina variety appeared to be the most susceptible. Pear branches from Frascati bore cankers caused by the *Fusarium willkommi* state of *Nectria ditissima* [*N. galligena*: 35, p. 91]. Deformation of the small branches and young leaves of cherry laurel (*Prunus laurocerasus*) was caused by *Sphaerotheca pannosa*. Wheat near Cagliari was attacked by *Septoria tritici*, and barley near Rome by *Helminthosporium sativum*. Tonda di Berlino and Bona potatoes grown near Viterbo from material obtained from Fucino developed rugose mosaic (potato viruses X+Y); Bona plants originating from Brunico were unaffected. Tomato plants at Albenga and Milan were attacked by *Cladosporium fulvum* [33, p. 567], while tomatoes everywhere were seriously affected by *Alternaria porri solani* [*A. solani*: loc. cit.] and some at Albenga by *Colletotrichum phomoides* [loc. cit.].

Brooks (N. E.). **Annual Report of the Secretary to the Federal Ministry of Agriculture, Rhodesia and Nyasaland, for the year ended 30th September, 1954.**— 115 pp., 1955.

In the section of this report dealing with Plant Pathology (pp. 63–64) [cf. *R.A.M.*, 34, pp. 436, 707] the following new diseases are reported as being of considerable importance: *Elsinoe phaseoli* [C.M.I. map No. 194; *R.A.M.*, 35, p. 92] causing scab of French beans [*Phaseolus vulgaris*], *Septoria passiflorae* [22, p. 393], fruit and leafspot of granadilla [*Passiflora edulis*], and *Colletotrichum tabacum* [35, p. 92] on tobacco.

Tobacco rosette [virus: 32, p. 670] was the principal disease of tobacco during the period under review, but symptoms were milder than in earlier outbreaks. Two cases of Granville wilt (*Pseudomonas solanacearum*) [27, p. 117] were reported, the first records for eight years. Leaf spotting due to *Cercospora nicotianae* was unusually prevalent.

Only two reports were received of *Puccinia polysora* [35, p. 12], which seems to be of little account in Rhodesia.

Stem-break (*Colletotrichum curvatum*) [35, p. 92] of sunn hemp [*Crotalaria juncea*] was again widespread and appeared for the first time in the low altitude areas of the eastern districts. As the disease was found to be carried by pods and other debris, seed cleaning and fungicidal dressing were recommended. Two new sap-transmissible virus diseases of sunn hemp were recorded.

Potato blight [*Phytophthora infestans*: 34, p. 314] was better controlled by Bordeaux or Burgundy mixture than by copper oxychloride or captan, but the first two caused considerable leaf scorch. The resistant variety Pentland Ace was markedly successful in field trials, though in two cases succumbing to race 3,4 [cf. 33, p. 250]. Blackleg (*Bacterium phytophthorum*) [*Erwinia phytophthora*: C.M.I. map No. 131], apparently imported with seed tubers, caused some damage to potatoes.

Juizo agro-pecuário do ano de 1955. [Report on agriculture and stock for the year 1955.]—*Gaz. Agric., Moçamb.*, 8, 80, pp. 2–6, 1956.

The following items of phytopathological interest occur in this report. Resistance to blight (*Phytophthora infestans*) in eight imported potato varieties tested in the Umbelúzi and Estatuene regions of Mozambique was graded in descending order as follows: Aquila, Monak, Alpha, Pentland Ace [see preceding abstract], Kennebec, Sebago, Majestic, and Arran Chief. The pathogen was destructive on tomatoes [*R.A.M.*, 31, p. 511] during the winter.

The best control of *Cercospora* [*Mycosphaerella*] *arachidicola* [17, p. 651; C.M.I. map No. 166] on groundnuts was secured by shortening the length of the rows, while the most effective treatment for *C. personata* [*M. berkeleyi*] was spraying with zineb or sulphur.

Physoderma zeae-maydis [*P. maydis*: No. 106] was reported for the first time in the Colony on maize in the Chimoio region, causing important damage. Other new records for the year included *Colletotrichum camelliae* and *Pestalotia theae* on tea in Gurué, *Puccinia allii* on garlic in Umbelúzi, *Botryodiplodia theobromae* on cacao in Palma, and *Pseudomonas maculicola* on cabbage in Moamba and Bobole.

Staff Reports of the Department of Agriculture, Bermuda, for the year 1953.—38 pp., 1954. [Received 1955. Multilithed.]

In the report of the Acting Plant Pathologist [cf. *R.A.M.*, 29, p. 35] A. G. Dunstan states (p. 9) that yellowed lilies [*Lilium longiflorum* var. *eximium*] were restored to a normal green colour within a month or so by dusting the soil with sequestrene NaFe [sodium iron] or alternatively ferro-green, and raking immediately.

In the report of the Assistant Horticulturalist (4 pp.) J. H. Jones states that no case of blight (*Phytophthora infestans*) was found on potatoes.

Evans (W. R.). **Report of the Director of Agriculture, 1954.**—*Rep. Dep. Agric. Bermuda, 1954*, 6+3 pp., 1955. [Multilithed.]

In this report the amount of proprietary iron chelate used to overcome the yellowing of lilies [see preceding abstract] is given as 40 lb. per acre applied in the early stages of growth.

Report of the Plant Protection section for the year 1954, Department of Agriculture, Cyprus.—123 pp., [? 1955. Mimeographed.]

On pp. 95–96 of this report [cf. *R.A.M.*, 32, p. 670] G. P. Georghiou states that the installation of a hygrothermograph at Kondea enabled warnings of potato blight (*Phytophthora infestans*) to be given to growers. Early blight (*Alternaria solani*) was locally somewhat severe on potatoes and tomatoes. Leaf spot of wheat (*Septoria tritici*) was prevalent, but of minor importance. Olive leaf spot

(*Cycloconium oleaginum*) [34, p. 44] was serious only in two areas, 37·3 lesions per 100 leaves being recorded in one case. *Taphrina deformans* on almond, *Uncinula necator* on grapes, and internal rust spot of potatoes were serious during the year. *Ascochyta rabiei* [32, p. 259] caused considerable damage to cowpeas in the Morphon area. T. Shiakides reports (p. 97) the erection of a quarantine glasshouse, especially for use with grapevine cuttings.

Annual Report of the Agricultural Experiment Stations, Florida, for the year ending June 30, 1954.—326 pp., 31 figs., 3 graphs, [? 1955. Received January, 1956.]

Much of the phytopathological information in this report [cf. *R.A.M.*, 34, p. 580] has already been noticed from other sources. W. B. Tisdale, W. D. Moore, and G. Swank state that in experiments at Gainesville in which chopped green lupin plants and fungus (including *Rhizoctonia*) inoculum were added to pots of sand 28, 21, 14, and 7 days before and on the day of sowing snap bean [*Phaseolus vulgaris*] seeds, disease (damping off and stem and root rot) was most severe when the seeds were sown 7 or 14 days after the organic matter and cultures were added. Percentage emergence was higher and root and stem rot less on beans planted the same day as the inoculum was added. The *Rhizoctonia* isolates employed varied in degree of pathogenicity. In certain field tests at Fort Lauderdale infection was significantly greater on soil bedded and planted on the same day than on bedded soil allowed to stand for 5, 10, or 15 days before planting. In pot tests 12 types of dried organic matter significantly reduced *Rhizoctonia* infection, while green material tended to increase it for a short period. Seed and soil treatment with pentachloronitrobenzene or pentachloroanisole at the time of planting significantly reduced *Rhizoctonia* infection in snap beans sown in sandy, muck, or marl soils and neither was phytotoxic. Further experiments by W. D. Moore showed that *Pythium* infection was reduced appreciably only by captan and vancide 51.

G. Swank, experimenting with the combination of two or more chemicals for the control of damping-off and root rot in [unspecified] vegetable seed-beds, found that pentachloronitrobenzene (mathieson 275) added to DD effectively controlled damping-off and reduced the amount of root injury as compared with DD alone. CBP–38 was effective against [unspecified] pathogenic organisms when applied as a drench at 1 gal. per 100 sq. yds., and DD as a drench at 30 gals. per acre also gave better control of damping-off fungi than when injected. Nemakril prevented damping-off most effectively.

Of several different virus isolates obtained from [chilli] peppers in the Everglades area J. N. Simons states that two appeared to be strains of cucumber mosaic virus [34, p. 699; 35, pp. 263, 416] and the third may be new. The latter appears to be confined to the Solanaceae, to be aphid-transmitted, non-persistent, and naturally present in black nightshade (*Solanum nigrum*).

Crosses were made by J. M. Crall during the autumn of 1953, in various combinations between the five most promising watermelon selections from the 1953 breeding plots and the varieties Congo, Fairfax, Blacklee, and Ironsides, and the unreleased lines 51–27 [33, p. 403] and Orton. All parents except Congo were highly resistant to *Fusarium* wilt (*F. oxysporum* f. [*F. bulbigenum* var.] *niveum*) [35, p. 266] and in most cases to anthracnose (*Colletotrichum lagenarium*) [35, p. 71] also. Eight F_1 lines were selected in 1954. One wilt-resistant Watson-type line was chosen for further selection from 15 segregating lines. In a strain test one long green selection of good quality (F53–3) was superior to both Congo and 51–27 in earliness and yield; a small round green selection (F53–5) was as early as Cannonball and outyielded all but one of five regional trial entries. Both selections were resistant to wilt and anthracnose. The most serious watermelon diseases during the year were gummy stem blight (*Mycosphaerella citrullina*) and downy mildew (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*. Arasan slurry, ortho seed protectant

slurry, and spergon dust were the most efficient seed protectants against *M. citrullina*, while zineb, crag 658, and tribasic copper sulphate gave the best control of this and *P. cubensis* in the field.

J. R. Large, reporting on the control of scab [*Cladosporium effusum*: 34, p. 759] and other foliage diseases of pecans, states that the order of scab control on 24th August was as follows: regular Bordeaux 4–1–100 followed by four applications at 6–2–100, and zineb (dithane Z78) 2 lb. in 100 gals. plus 1 qt. summer oil, both 92·5 per cent.; split Bordeaux mixture-ziram plus 1 qt. summer oil, 92 per cent.; tag 331 (phenyl mercury acetate) at $\frac{1}{4}$ pt. to 100 gals., 77 per cent.; unsprayed, 17 per cent.

P. Decker and C. W. Anderson report that of 300 [chilli] pepper (*Capsicum frutescens*) selections tested for tolerance of or resistance to tobacco etch virus [33, p. 402] by inoculation in the four-leaf seedling stage, many of the ornamental type exhibited only stunting while the commercial bell types showed leaf mottling or etch. The intermediate type showed mild leaf mottling but often severe leaf roll. No symptoms developed on the fruit. The leaf roll symptoms were not associated with reduced fruit set or decreased production and may constitute a type of resistance useful in a breeding programme, in which several selections of ornamental varieties showing no etch symptoms will also be used.

According to H. N. Miller, soil fumigation with methyl bromide MC–2 gave 90 per cent. control of *Fusarium* wilt [*F.* spp.: 24, p. 60], bacterial blight [*Erwinia chrysanthemi*: 35, p. 456], and [unspecified] root rots of chrysanthemum.

P. Decker states that [unspecified] virus diseases continue to be the most important limiting factor in yellow lupin production [33, p. 71]. Of 213 F_2 breeding lines tested in the greenhouse and field, 37 were selected for further study. A time lag in symptom appearance exhibited by seedlings inoculated in the greenhouse may indicate tolerance or resistance of the host.

Strawberry leaf spot (*Mycosphaerella fragariae*), which has become a serious problem on the variety Florida Ninety in the Starke area, was reduced in preliminary greenhouse trials by orthocide [captan] sprays.

Further investigations by R. F. Suit of materials for the control of citrus melanose [*Diaporthe citri*] disclosed that basic copper arsenate plus copofilm, also cunizene (an organic copper), and captan at 2 lb. per 100 gals. plus 10 lb. wettable sulphur or 4 lb. magnetic-70 sulphur paste were satisfactory, in addition to the materials already reported [34, p. 581]. E. F. Hopkins, K. W. Loucks, and A. A. McCornack report in connexion with citrus decay control research that when oranges were merely washed on arrival from the grove either before being placed in the colouring room or before a standing period of 48 hours, when degreening was not necessary, and processing finished without fungicidal treatment there was less decay (significant at the 5 per cent. level) than in the check lots washed and processed with no such intervening standing period. Stem-end rot [? *Diplodia natalensis*: 35, p. 97] and mould [*Penicillium italicum* and *P. digitatum*] were reduced by 17 per cent. in oranges held at 70° F. for two weeks and by 49 per cent. at 60°. Excellent decay control was obtained in a series of 14 experiments in which dowicide A-hexamine was flooded on the fruit as it passed over the washer brushes of the packing house machine, the rest of the process following as usual. Careful counts were also made of the percentage of stem-end peel breakdown (a physiological trouble of unknown cause occurring after degreening) in treated fruits; the average percentages of fruit affected were less than the average for the untreated lots. Further studies on the ammonium bicarbonate treatment showed that superficial moulds tended to develop on dead button tissue and fruit scale, or that the peel was damaged, when the chemical was used alone and not in conjunction with dowicide A-hexamine.

Further studies by L. C. Knorr and W. C. Price on citrus tristeza virus [35, p. 293] disclosed its presence in a 65-year-old tree in Pinellas county. It had evidently

been affected for some considerable time, since the trunk of the scion was severely honeycombed [34, p. 366]. Indexing showed none of 25 adjacent trees to be infected.

Attempts to transmit tristeza virus to non-rutaceous plants have not been successful. Ten species of aphids collected on citrus and allied hosts are listed. Some reactions, aberrant compared with those in South America, may be due to mixed virus infection. The tristeza virus was found to survive a temperature of 55° C. for five or more minutes in living plant tissue and 45° for four hours or more.

There are indications that the suspect range of tristeza differs from that in South America and South Africa as *Aeglopsis chevalieri*, which reacts strongly to inoculation in Argentina, has not yet been infected in Florida. One of the tristeza sources included in these attempts to infect *A. chevalieri*, however, also contained the psorosis virus [35, p. 178]. Though no symptoms of either virus appeared on *A. chevalieri*, yet when the symptomless plants of this host were grafted to Key lime, though no tristeza virus was transmitted, psorosis virus patterns emerged on the limes. Psorosis was also transmitted from the *Aeglopsis* to sweet orange seedlings, suggesting a method whereby a mixture of tristeza and psorosis viruses might be separated. In testing for tristeza by transmission to Key lime, at least five test plants per suspect were used to offset any genetic or cultural differences.

According to A. E. Kretschmer St. Augustine grass (*Stenotaphrum secundatum*) on Everglades peaty muck soil bore small, elongated, solid brown areas, appearing first on the older blades, and due to potassium deficiency. The symptoms may be confused with those of *Piricularia oryzae* which have an ash grey centre.

T. E. Summers states that the most serious diseases of *Sansevieria* spp. appear to be caused by *Glomerella cingulata*, *Fusarium* sp., and a bacterium, probably *Erwinia carotovora* [23, p. 343].

R. S. Cox reports that preliminary isolation and greenhouse pathogenicity data suggest that the agent of *Fusarium* yellows of celery [*F. apii*: 31, p. 4] is an important contributing factor to mortality and poor growth of seedlings in the seed-bed. Following transplanting, *Phytophthora capsici* [34, p. 126] was common on [chilli] pepper on the east coast, frequently destroying several acres in a field.

J. M. Walter states that weekly applications of tribasic copper, cop-o-zim, and yellow cuprocide gave satisfactory control of tomato black spot (*Phoma destructiva*) [31, p. 542]. According to R. A. Conover bacterial spot (*Xanthomonas vesicatoria*) was the most serious tomato disease at Homestead; grey leaf spot (*Stemphylium solani*), blight (*Phytophthora infestans*), and [unspecified] virus diseases were also important locally.

R. O. Magie reports that sclerotia of *Stromatinia* [*Sclerotinia*] *gladioli* formed abundantly on rotted gladiolus roots [35, p. 368]. Corm treatment with N.I. ceresan [loc. cit.] controlled neck rot on new land but not the root rot phase. Infection by *Curvularia lunata* [35, p. 455] was found on leaves of planting stock of the varieties Snow Princess, Valeria, Hopmans Glory, and Morning Kiss, which had previously been considered resistant. Manzate 2–100, manzate alternated with zineb (both at 2–100), and zineb alone were superior to 2 qt. nabam plus $\frac{3}{4}$ lb. zinc sulphate per 100 gals. in controlling *Botrytis* leaf spot [*B. gladiolorum*: 34, p. 788]. Manzate was also superior to nabam plus zinc sulphate against *C. lunata*.

R. A. Conover states that three viruses differing widely in symptoms, host range, and physical properties commonly infect cultivated and wild papaw in Florida, singly or combined [32, p. 575]. Two new fruit diseases of this crop were troublesome during the summer and autumn; one was characterized by excessive bleeding from slits on the distal halves, extending $\frac{1}{2}$ in. or more into the flesh, and the other, termed 'slipskin', by large areas of a scalded or frozen appearance on the fruit surface which slipped readily on handling. Both appeared to be infectious but neither yielded a pathogen.

A. N. Brooks reports that during a survey of strawberry beds in central Florida, very few aphids were found and none belonging to *Capitophorus*. The variety Florida Ninety, which has been grown commercially many times immediately adjoining virus-infected Missionary plants, has not yet become infected. It is suggested that new varieties might be maintained virus-free by growing in Florida.

Klemmer (H. W.), Riker (A. J.), & Allen (O. M.). **Inhibition of crown gall by selected antibiotics.**—*Phytopathology*, 45, 11, pp. 618–625, 1 fig., 1 diag., 4 graphs, 1955.

Experiments were conducted at the Departments of Bacteriology and Plant Pathology, University of Wisconsin, to determine the effects of eight antibiotics [cf. *R.A.M.*, 29, p. 146] on five strains of *Agrobacterium tumefaciens* grown on a modified form of Allen's medium containing mannitol and yeast extract (Experiments in soil bacteriology. Burgess, Minneapolis, Minnesota, 1951), and infecting plants of Bonny Best tomato and the Sunset Giant variety of *Tagetes erecta*.

The growth of the virulent T11 and A6 strains and of the attenuated A6–6 was inhibited to the extent of 50 per cent. [cf. 31, p. 480] by aureomycin, terramycin, and chloramphenicol within a range of 0·026 to 0·28 μg. per ml. and by clavacin, streptomycin, polymyxin, tyrothricin [gramicidin: 25, p. 571], and penicillin between 2·05 and 8·4 μg. per ml.

Introduced by root absorption, terramycin at 2, aureomycin at 5, and chloramphenicol at 4 μg. per ml. suppressed crown gall development at the 50 per cent. level in tomato plants inoculated with a virulent strain of the pathogen. At concentrations of 20, 50, and 125 μg. per ml., respectively, they caused little or no damage to healthy plant tissue while completely inhibiting gall formation. At 500 μg. per ml. streptomycin almost entirely prevented gall production but was moderately phytotoxic.

Cultures of *A. tumefaciens* resistant to chloramphenicol and polymyxin, respectively, were used in the inoculation of antibiotic-treated plants, and bacteria-free crown gall tissue was grown on a medium containing either of the same two antibiotics or terramycin. All three antibiotics inhibited the growth of the bacteria-free tissue, while chloramphenicol and polymyxin acted similarly in the plants inoculated with resistant bacteria. These two antibiotics induced a distinct type of gall inhibition curve in both the *in vitro* and *in vivo* tests, whereas the responses induced by terramycin in gall tissue cultures and in plants were of a different order. The evidence suggests that gall inhibition by aureomycin, terramycin, and chloramphenicol was caused largely by activity against the crown gall cells, without influencing the normal tissue. Terramycin and chloramphenicol moved rapidly from the roots into the leaves of tomato plants, little of either remaining in the stems. After ten days the activity of the two substances in the leaf tissue was estimated at 47 and 80 per cent., respectively.

Braun (A. C.) & Naf (U.). **A non-auxinic growth-promoting factor present in crown gall tumour tissue.**—*Proc. Soc. exp. Biol., N.Y.*, 86, pp. 212–214, 1 fig., 1954.

In this further study at the Rockefeller Institute for Medical Research, New York [cf. *R.A.M.*, 34, p. 774 and following abstracts], the author investigated the possibility that factors additional to growth substances of the auxin type might stimulate cell proliferation in tumour tissues. A biologically active factor was obtained from crown gall [*Agrobacterium tumefaciens*] tumours in *Vinca rosea*, which in association with an auxin caused active proliferation of normal tobacco pith tissue, a condition which could not be brought about by the tumour extract factor or by the auxin separately.

Klein (R. M.). **Mechanisms of crown-gall induction.**—*Symp. Biol., Brookhaven*, 6 (Abnormal and Pathological Plant Growth), pp. 97–114, 6 figs., 2 diags., 1 graph, 1954. [Multilithed.]

This further study of crown gall (*Agrobacterium tumefaciens*) [*R.A.M.*, 34, p. 710 and preceding and next abstracts] at the Department of Botany, University of Chicago, concerns the first or transformation period of tumour development (*Proc. nat. Acad. Sci., Wash.*, 38, pp. 1066–1072, 1952). This period includes four phases, pre-induction, induction, promotion, and completion, which are set out diagrammatically. The first of the known etiological agents to be active in this series are substances released by wounding, which convert normal cells to conditioned cells. During the induction phase the conditioned cells are acted upon by a tumour-inducing principle, possibly a specific desoxyribonucleic acid, which is formed by bacteria with the necessary hereditary constitution and may be synthesized only in the presence of wound substance. As a result of this action incipient tumour cells are formed. The only characterized etiological agent acting on these is auxin, either synthesized by the bacteria or possibly formed by tissues adjacent to the incipient tumour cells or the cells themselves. These are then changed to enlarged promoted cells. The existence of agents acting on the latter can as yet only be inferred, but with the first division of the resulting primary tumour cells the transformation period ends.

De Ropp (R. S.). **The experimental inhibition of the growth of plant tumours.**—*Symp. Biol., Brookhaven*, 6 (Abnormal and Pathological Plant Growth), pp. 128–136, 1 diag., 1954. [Multilithed.]

In discussing the inhibition of growth in plant tumours, especially those of crown gall [*Agrobacterium tumefaciens*: see preceding abstracts], the author points out that whereas healthy plant growth is the resultant of two processes, the production in turn of auxins and anti-auxins, in plant tumours this balance is upset, resulting in hyperauxiny [*R.A.M.*, 21, p. 186]. The inhibition of tumour growth should ideally be brought about by restoring the normal mechanisms. Large numbers of substances have been investigated, several of which will inhibit tumour growth at concentrations as low as one part in a billion [1,000 million], the folic acid analogue, A-methopterin, being one of the most active of such agents, but apparently none has a specific effect on the growth of tumour tissue, and in every case of inhibition healthy tissue is destroyed as well. Further knowledge is needed of the differing metabolic processes in healthy and tumour cells, especially those concerned with the synthesis and destruction of the natural auxins.

Siller F. (L. R.). **La eficacia de ciertas fungicidas contra el Phytophthora palmivora Butl.** [The efficacy of certain fungicides against *Phytophthora palmivora* Butl.]—*Suelo tico*, 8, 34, pp. 168–172, 1955. [Received April, 1956.]

Some of the information in this paper concerning the results of experiments on the control of *Phytophthora palmivora* on cacao conducted in the La Lola plantation, Costa Rica [*R.A.M.*, 35, p. 169] in 1949–50 has already been noticed [32, p. 476]. The various fungicides used (all except Bordeaux mixture at 0·5 per cent.) were tested by a method already described [32, p. 70]. The lowest percentages of infection 28 days after inoculation and treatment were given by 1 per cent. Bordeaux mixture 7, yellow cuprocide 15·5, tribasic copper sulphate 12·3, copper A 33, bioquin 1 34·4, and crag 531 47, compared with the uninoculated control 47·9 and the inoculated, untreated control 100. In another experiment the percentages 26 days after inoculation were: 1 per cent. Bordeaux 86·2, bioquin 1 78·1, yellow cuprocide 79·5, tribasic copper sulphate 91·9, and the inoculated, untreated control 100.

Thorold (C. A.). **Observations on black-pod disease (Phytophthora palmivora) of Cacao in Nigeria.**—*Trans. Brit. mycol. Soc.*, 38, 4, pp. 435–452, 1 pl., 2 graphs, 1955.

At the Department of Agricultural Research, Nigeria, an investigation was made of the biological and climatological factors on which current methods of controlling cacao black pod disease (*Phytophthora palmivora*) [*R.A.M.*, 35, p. 428] are based [32, pp. 12, 13; 35, pp. 164, 169]. The fact that the pathogen does not appear to have any other host in the cacao-growing area simplifies control measures and may limit any possible variability in Nigeria.

The most practicable pod inoculation methods, using sporangia from the surface of living pods, were as follows. When relatively few were available they were picked up with a cellophane disk about 3 mm. in diameter with a pin through the centre [cf. 32, p. 12] which was pushed into a healthy pod. Otherwise the sporangia were transferred on the tip of a knife blade, generally wounding the surface, or else a suspension was sprayed on with an atomizer or flit gun. When inoculation was accompanied by wounding, symptoms generally developed within three days; by the spraying method without wounding the interval varied from two to 15 days, the highest number of infected pods (29 and 25 in a total of 122) occurring after four and five days, respectively. When 258 infected pods from three localities in Nigeria were classified on site of infection, 38 per cent. had lateral spots, 47·7 distal, and only 14·3 proximal [cf. 8, p. 27]. Observations suggested that the relative frequencies of different infection sites may be affected by pod length, distal infections tending to occur on relatively shorter and younger fruits. Moisture is commonly retained at the distal ends of young fruits. Anatomical features near the two extremities suggest that the proximal region may offer greater difficulties for germ-tube penetration than the tip and sides.

The area of discoloration on inoculated pods was approximately doubled on each successive day until the pod approached maturity, when the rate decreased. A series of limited observations indicated that cushion infection [35, p. 361] is likely to occur if an infected pod remains on the tree for about two weeks from the first appearance of the spot. Less than 1 per cent. of infected cushions gave rise to subsequent pod infection.

Young chupons also were infected successfully by spraying with a sporangial suspension. Brown lesions developed after five days, the young leaves wilted, and later sporangia were produced sparsely. However, the natural occurrence of chupon wilt in Nigeria is believed to be uncommon.

Sporangial production on the pod generally commences between 8 p.m. and 6 a.m. following the second day of visible symptoms. It becomes general over the surface within five to ten days of initial symptom appearance. One diseased pod was apparently associated with infection of adjacent healthy pods for 20 days. Sporangia were shed during both day and night equally.

When 14 healthy pods were placed on a heap of black pods about one year old all became infected; similarly, of six in contact with two-year-old pods only three became infected. In one case soil infection was detected by placing seven healthy pods on the ground near a suspected tree, when all developed infection.

Preliminary studies on the effect of climate on incidence indicated that in 1952 black pods occurred at Agodi and Owena from June to November, during which period the mean relative humidity did not fall below 80 per cent. Although December is nominally a dry-season month, suitable conditions for infection may also occur then as the relative humidity rises above 95 per cent. for more than 12 hours a day and falls below 80 per cent. for only six, even in the virtual absence of rainfall. The 1952 epidemic did not start until there was a sufficient number of pods present, as well as adequate rainfall.

Orellana (R. C [G].). **Enfermedades del Cacao en Venezuela, Colombia, Ecuador y Trinidad.** [Diseases of Cacao in Venezuela, Colombia, Ecuador, and Trinidad.]—*Agricultura trop.*, 10, 12, pp. 27–31, 1954.

This information has already been noticed from another source, in English [*R.A.M.*, 33, p. 593].

Leukel (R. W.) & Tapke (V. F.). **Cereal smuts and their control.**—*Fmrs' Bull. U.S. Dep. Agric.* 2069, 28 pp., 18 figs., 1954.

This well-illustrated publication, replacing an earlier bulletin on wheat smuts [*R.A.M.*, 13, p. 153], describes the smuts of all cereals in the United States and the general control methods to be employed against each. The latter part of the bulletin deals in more detail with control treatments, the various proprietary materials suitable for these, and their use.

Ekstrand (H.). **Undersökningar över Berberis och svartrost I. Olika Berberisarters mottaglighet för svartrost, Puccinia graminis Pers. II. Groningsförsök med Berberis vulgaris L., med speciell hänsyn till natriumkloratets verkningar på groningen.** [Studies on *Berberis* and black rust I. The susceptibility of different species of *Berberis* to black rust, *Puccinia graminis* Pers. II. Germination experiments with *Berberis vulgaris* L., with special reference to the effects of sodium chlorate on germination.]—*Medd. Växtskyddsanst., Stockh.*, 68, 74 pp., 5 figs., 4 graphs; 69, 29 pp., 11 graphs, 1955. [English summaries.]

This important, fully tabulated monograph, supplemented by extensive lists of references, contains much valuable information on barberries in relation to cereal black rust (*Puccinia graminis*), based on observations at the Plant Protection Institute, Stockholm [cf. *R.A.M.*, 35, p. 171], covering the period from 1933 to 1951. The material comprised numerous species and varieties of *Berberis* from Swedish and foreign botanical gardens.

Newly formed aecidia were detected from the beginning of June to the end of August or early September. The degree of infection varied in different years; in the Bergian Botanical Garden, for instance, it was generally slight to moderate on *B. vulgaris* and its vars. *atropurpurea* and *enuclea* from 1939 to 1941 and moderate (heavy in one case) from 1942 to 1948, inclusive.

The results of inoculation tests on barberries raised from seed demonstrated an increase in susceptibility with advancing age, a phenomenon which may explain the negative reactions of many experiments on young potted plants.

Cereals do not necessarily sustain the heaviest damage in years when barberries are severely rusted. In 1951, for example, there was a destructive epiphytotic of black rust on wheat [32, p. 306], with very little infection on barberries. Climatic conditions are the controlling factor.

Two types of resistance to *P. graminis* in barberries are differentiated, namely, passive [6, p. 470] and active or physiological [cf. 12, p. 15]. Both types reside in *Mahonia aquifolium*, while the passive resistance of *B. soulieana* is probably accompanied by a high degree of physiological susceptibility. It is thought that the marked differences in infectivity between the several biotypes and formae speciales of *P. graminis* may partly account for the discrepancies in the results of inoculation experiments reported from various quarters. In some years aecidia were found on the leaves as well as the fruits of *M. aquifolium*.

Among the most susceptible barberries [cf. 33, p. 521] in Sweden are *B. aetnensis*, *B. amurensis*, *B. cretica*, *B. nummularia*, *B. pachyacantha*, and *B. neubertii* (*M. aquifolium* × *B. vulgaris*), while a high degree of resistance or quasi-immunity has been shown by *B. aggregata* and its var. *prattii*, *B. buxifolia* var. *nana*, *B. chenaultii* (*B. gagnepainii* × *B. verruculosa*), *B. gagnepainii*, *B. julianae*, *B. koreana*, *B. mentorensis* (*B. julianae* × *B. thunbergii*), *B. parvifolia*, *B. sargentiana*, *B.*

thunbergii, and *B. verruculosa*. It is considered doubtful whether any species of *Berberis* is completely immune from all physiologic races of *P. graminis*. In every country, therefore, the policy should be to permit the cultivation exclusively of those species which are resistant in that particular area, eradicating all others.

Experiments were performed to settle the question of a possible stimulatory action on the germination of barberry seeds under sprayed bushes of the sodium chlorate eradicant officially recommended for use in Sweden [33, p. 77]. While there is some evidence that unduly small quantities of the chemical may stimulate germination, the toxicity of even the low concentration of 500 kg. per ha. was so great that only a few seedlings emerged and then died, and at the prescribed level of 4,500 kg. germination and growth are completely excluded.

Duff (A. D. S.). **Resistance to take-all disease in Kenya Wheat 131. II. Effect on yield.**—*E. Afr. agric. J.*, 21, 1, pp. 32–33, 1955.

In further studies of the resistance of Kenya wheat 131 to take-all (*Ophiobolus graminis*) [*R.A.M.*, 34, p. 778], experiments conducted over two growing seasons showed that under conditions of heavy artificial infection this variety sustained no appreciable loss of yield, which in the susceptible Kenya Governor amounted to 48·5 per cent.

Villanueva Novoa (R.). **Ensayos uniformes con Trigos híbridos.** [Uniform trials with hybrid Wheats.]—*Bol. Exp. agropec., Lima*, 3, 3, pp. 16–19, 1954.

Since 1952 comparative trials have been conducted by the Agricultural Experiment Station, La Molina, Peru, to determine the reaction (resistant, segregating, or susceptible) of 99 hybrid wheat lines to various rusts (*Puccinia* spp.) [*R.A.M.*, 34, p. 217], with comparison for yield with a local variety, at altitudes ranging from 48 to 3,852 m. above sea-level.

The following recommendations are made, according to the rust severity at various localities (which is tabulated). From 0 to 1,500 m. the varieties grown must be primarily resistant to stem rust (*P. graminis*) and brown rust (*P. rubigo-vera tritici*) [*P. triticina*], and moderately so to yellow rust (*P. glumarum*). From 1,500 to 2,500 m., the altitudes most favourable to rusts, the varieties must be resistant primarily to *P. graminis* and *P. glumarum* and moderately so to *P. triticina*; at higher altitudes they must be primarily resistant to *P. glumarum* and moderately so to *P. graminis*.

Lein (A.). **Resistenzzüchtung gegen Flugbrand bei Sommer Gerste.** [Breeding for resistance to loose smut in summer Barley.]—*Z. PflBau*, 6 (50), 5, pp. 243–247, 1955.

Following an outline of the history of breeding barley for resistance to loose smut [*Ustilago nuda*] in Germany [*R.A.M.*, 24, p. 362 *et passim*], an account is given of inoculation experiments at Schnega, Hanover, using Moore's vacuum method [15, p. 567], on the F_7 to F_9 of five selected populations, two of which were descended from the Japanese Miki Hadaka variety, two from the Himalayan Nepal variety, while the other was a cross between two lines, one with the former and one with the latter in its ancestry. All compared favourably in resistance with the Pirol variety used as a standard. The inheritance of resistance appears to be relatively simple and the character is usually dominant.

Ponchet (J.). **Sur le traitement de la carie du Blé et du charbon de l'Avoine.** [On the treatment of Wheat bunt and Oat smut.]—*Ann. Inst. Rech. agron.*, Sér. C (*Ann. Épiphyt.*), 6, 3, pp. 301–313, 1955.

Further experiments carried out at the Central Station of Plant Pathology, Versailles, France, in 1953 and 1954 on the control of wheat bunt (*Tilletia caries*)

[*R.A.M.*, 31, p. 484], and in 1952–54 on that of loose smut of oats (*Ustilago avenae*) [27, p. 517] by seed treatments with numerous products are described. The results obtained partly explain why certain benzene derivatives, used as seed treatments, successfully control soil infection by *T. caries*. The effect of hexachlorobenzene appeared to be due partly to the action of a saturated solution of the product becoming diffused in the vicinity of the treated seed; the quantity of 10 per cent. dust carried by one seed was sufficient to saturate at least 500 ml. of water. With seeding at the usual rate, the amount of the dust present on the seed would, in theory, saturate a certain volume of soil sufficiently to render it impossible for the spores present in it to germinate. Hexachlorobenzene vapour inhibited the germination of *T. caries* spores held in suspension in drops of water in a saturated atmosphere, which may partly explain its mode of action when the product is introduced into the soil on seed. Lastly, the fungicidal activity of tetrachloronitrobenzene [tecnazene] persisted for 45 days after sowing and that of hexachlorobenzene for 30 days. Thus, both appear to be able to exert an internal effect on *T. caries* after it has penetrated the seedling.

Loose smut of oats can be controlled completely by the use of formalin or organo-mercury products, particularly those which emit toxic vapours. Seed treated with volatile organo-mercury products should be kept for at least two days in a confined atmosphere before sowing.

Wagner (F.). **Zur Frage der Haferflugbrandbekämpfung mit quecksilberhaltigen Trockenbeizmitteln.** [On the question of the control of Oats loose smut with mercury-containing disinfectant dusts.]—*Z. PflBau*, 6 (50), 5, pp. 235–236, 1955.

Loose smut of oats [*Ustilago avenae*] is no longer a problem in the general cultivation of the crop in Germany, where it is, in fact, difficult to find a sufficient number of samples for the annual official tests of fungicides. The position is different, however, in the areas allotted to seed production, e.g., the Fichtel mountains (Bavaria), where the certification rules do not allow more than five diseased plants in an area 80 by 1·8 m., resulting in the rejection of 20 per cent. of the 1952 crop in the Weiden district.

In disinfection tests in 1954 on two lots of Weihenstephaner White seed with an average of less than 4 per cent. loose smut, mercurial No. 1 gave almost complete, and two experimental preparations [all unnamed] absolute control, whereas in 1955, when emergence was delayed by very dry weather, only a methylmercury dust was entirely effective, though the above-mentioned experimental preparations reduced the incidence of infection from 12·75 per cent. to a trace. All the treatments were made at a dosage of 300 gm. per 100 kg. seed.

Miczyński (K.). **Studia nad wrażliwością odmian Owsa na głownię przy sztucznym zakażeniu. Część II.** [Studies on the susceptibility of Oat varieties to smut. Part II.]—*Acta agrobot.*, 3, pp. 178–217, 1955. [English and Russian summaries.]

From 1948 to 1953 studies were carried out conjointly by the Department of Plant Breeding, School of Agriculture, Cracow, and the Institute of Plant Breeding and Acclimatization to determine the biotype differences between populations of oat smut (*Ustilago avenae*) [*R.A.M.*, 15, p. 280] occurring in Poland and the reaction of a large number of oat varieties not tested in earlier experiments (*Roczn. Nauk rol.*, 66, 1952). Lischower Früh, Lochows Gelb, Richland, Gopher, Nicol, Camas, and Fulghum were chosen as differential varieties, 0 to 10 per cent. infection being classified as resistance and over 30 per cent. as susceptibility. Of 44 smut populations derived from 31 original collections, 68 per cent. failed to affect any of the varieties severely. More aggressive races were much less numerous, collection No.

12 from Rokiciny near Nowy Targ being the most virulent and affecting four of the differentials.

In inoculation experiments in 1948 and 1952 with a virulent race and a less aggressive one high resistance was shown by 45 per cent. of the 100 varieties tested, including all those of *A. strigosa*, most of *A. byzantina*, and many of *A. sativa*, among them the Polish Antoniński Najwczešniejszy, Grodkowicki, Jeżewski, and Więçławicki Jubilenszowy. Of the 11 more promising oat varieties inoculated with 14 populations in 1953, Jeżewski, Forvic, and Sofia 6 were completely or highly resistant. Among the foreign varieties tested, Forvic, Sofia 6, Black Mesdag, Gothland, and Lelina showed the highest resistance throughout the investigations.

Tveit (M.). **Pathogenicity of species of Helminthosporium from Brazilian Oats.**—*Phytopathology*, **46**, 1, pp. 45–48, 1 fig., 1956.

Some of the information in this study at the Minnesota Agricultural Experiment Station on pathogenicity and physiologic specialization in *Helminthosporium victoriae* and *H.* [*Pyrenophora*] *avenae*, isolated from samples of Brazilian oats, has already been noticed from another source [*R.A.M.*, 33, p. 345]. There were no clear-cut or consistent differences in range of pathogenicity between the two species on eight varieties of oats, except that Andrew was immune from all the isolates of both species, as well as from the weakly parasitic *H. pedicellatum* [loc. cit.].

It is postulated that *H. victoriae* may have been introduced into the United States on breeding material from Brazil. Once established in the seed stocks it might have increased and spread rapidly in the absence of the antagonistic *Chaetomium* spp. operative in its native habitat [34, p. 447], causing the destructive outbreaks of blight in the former country since the detection of the fungus in 1945 [26, p. 99].

Craigmiles (J. P.) & Jensen (N. F.). **Determining disease losses in Oats.**—*Agron. J.*, **47**, 12, p. 591, 1955.

Isogenic lines should logically measure disease losses most accurately since they minimize the effect of variables other than disease reaction. At Cornell University, New York, the eleventh generation of selfing a parent F_4 line of an oat selection (526), hitherto believed to be homozygous, became subject to an epiphytotic of *Helminthosporium victoriae* [*R.A.M.*, 35, p. 443] and was found to consist of plants resistant, susceptible, and heterozygous for reaction to Victoria blight. Lines in each of these classes were selected, increased, and subsequently inoculated with *H. victoriae* by dipping the seed in a spore suspension before sowing. While the uninoculated controls gave similar yields, indicating their isogenic nature, the effect of blight on the segregating and susceptible strains was clearly evident, the reductions in yield being 65 and 96 per cent., respectively.

Tessi (J. L.). **Razas de distinto poder patogéno dentro de 'Pseudomonas striafaciens' en Argentina y reacción de variedades de Avena a su ataque.** [Races of different pathogenicity in *Pseudomonas striafaciens* in Argentina and reaction of Oat varieties to their attack.]—*Rev. Invest. agríc., B. Aires*, 6, 2, pp. 235–245, 2 pl., 1952. [Received February, 1956.]

Studies were made at the Phytotechnical Institute, Buenos Aires, on the properties and pathogenicity of the oat stripe blight pathogen, *Pseudomonas striafaciens*, which was observed in Argentina in 1949, and its differentiation from *P. coronafaciens* [*R.A.M.*, 34, p. 779]. Although the disease is widely distributed severe attacks seldom occur owing to the high resistance of the oat varieties commonly grown.

Certain Argentine oat varieties, previously all shown to be resistant, were

inoculated with 17 different cultures of *P. striafaciens*, which comprised three physiological races. Varieties D.L.M_3, La Estanzuela F_2 au 12, and Bagé sel Klein were susceptible to race 1, the first two resistant and the third susceptible to race 2, and all resistant to race 3. These varieties retained the above reactions towards all the cultures used. Of the varieties resistant to all the strains the best were Fulghum C.I. 708, Kanota C.I. 839, and the Argentine variety Klein Mar, followed by Quincy Red (Quincy 1), Lee C.I. 2542, Letoria C.I. 3392, Fulgrain strain 4, and Buck sel. 212.

McKay (R.), Loughnane (J. B.), & Kavanagh (T.). **Virulent attacks of eyespot on Oats.**—*Nature, Lond.*, 177, 4500, p. 193, 1956.

In 1955 crops of spring-sown Victory, Sun II, and Glasnevin Triumph oats in cereal rotations in 12 counties in Ireland suffered severe lodging associated with *Cercosporella herpotrichoides* [*R.A.M.*, 33, p. 409], some crops having 80 per cent. damage. Typical eyespot lesions were scanty, but the presence of the fungus was confirmed microscopically. The attack is considered to be connected with the wet weather in May, June, and early July, followed by exceptionally warm weather through August.

Wagner (F.). **Über die Anwendung von Zwergbrandbekämpfungsmitteln zur Bekämpfung des Schneeschimmels an Winterroggen in Höhenlagen.** [On the application of dwarf bunt control preparations to combat the snow mould on winter Rye in upland areas.]—*Z. PflBau*, 6 (50), 5, pp. 237–242, 2 figs., 1955.

A tabulated report is given of experiments, already noticed from a preliminary note [*R.A.M.*, 35, p. 443], in the uplands of Bavaria in 1955 resulting in the complete control of snow mould (*Fusarium*) [*Calonectria nivalis*] on Petkus winter rye, which ranged from 30 to 63 per cent. in the untreated plots. Soil applications of brassicol-super were almost equally effective at the 50- and 75-kg. per ha. rates and it is assumed that 20 kg. of the spray would suffice. There is considered to be no doubt that the treatment is economically profitable under local conditions.

Lund (S.) & Shands (H. L.). **The response of Oat strains to Septoria avenae.**—*Phytopathology*, 46, 1, pp. 48–50, 1956.

Of some 3,500 strains of the World Oat Collection inoculated with a mycelial suspension of *Leptosphaeria avenaria* [*R.A.M.*, 34, p. 637] at the Wisconsin Agricultural Experiment Station in 1951, about 250 were selected as combining sufficient resistance with agronomic interest to merit further trials in 1952 and 1953 [cf. 34, p. 715]. None of the lines was immune, but many were as resistant as or more so than the variety Clintafe, used as a check. Most of the resistant selections were late in heading and maturity.

Noble (M[ary]) & Montgomerie (I[sabel] G.). **Seed-borne Oat diseases. Straw-breaking and brown foot-rot.**—Reprinted from *Scot. Agric.*, 34, 1, 4 pp., 8 figs., 1954.

An account is given of the symptoms of the straw-breaking disease of oats in Scotland, caused by *Septoria avenae* [*Leptosphaeria avenaria*: *R.A.M.*, 25, p. 155; 33, p. 504]. Lesions are sometimes found on the husks and grain and experiments have shown that the disease can be seed-borne.

Brown foot rot of oats, caused by *Calonectria nivalis* [loc. cit.], and hitherto regarded as rare in Great Britain, is also often seed-borne and has been found commonly in Scotland during recent surveys. Severe seed-borne infection may seriously affect young seedlings and result in poor stands. Seed dressings are effective in controlling both diseases when infection is superficial, but less so if the seed has been penetrated by the fungi.

St. Garay (A.) & Ádám (Hedwig). **Chemische Untersuchungen verschiedener alkaloidhaltiger Mutterkorn-Sclerotien.** [Chemical studies of various alkaloid-containing ergot sclerotia.]—*Naturwissenschaften*, 42, 24, pp. 646–647, 1955.

In further analytical studies on ergot [*Claviceps purpurea*] sclerotia at the Medicinal Plant Research Institute, Budapest, Hungary [*R.A.M.*, 35, p. 364 and next abstract], the alkaloid content of albino individuals was lower than that of the pigmented. The red ones, with a medium alkaloid content, contained neither sclererythrin nor yellow pigment; the latter was, however, the only colouring matter and occurred in large quantities in the brown variants, which contained up to 3 mg. alkaloids per gm.

Békésy (N.). **Ein Beitrag zur Biologie des Mutterkorns.** [A contribution to the biology of ergot.]—*Phytopath. Z.*, 26, 1, pp. 49–56, 5 figs., 1956.

The author's observations on some aspects of the general biology of *Claviceps purpurea*, made in the course of studies on ergot breeding and cultivation in Hungary [*R.A.M.*, 18, p. 314], are summarized and discussed in relation to ten contributions to the literature on the subject [cf. 34, p. 225] under the headings of fixation of the germinating sclerotia in the soil (by means of a collar of hyphae at the base of the stipe); development of the sclerotium; specific resistance of rye tissues; and host range [35, p. 237].

Experiments at the Medicinal Plant Research Institute, Budapest, involving repeated puncture of over 600 rye shoots with thin needles and injection of the inoculum with a Pravaz spray, resulted in 32 haulm and 140 ovary infections, while only one leaf gave a positive reaction.

Working in Germany, Stäger [2, p. 115] found *Bromus erectus*, *Lolium perenne*, and *Melica uniflora* resistant to infection, but ergot developed normally in these species in the present series of tests with inoculum from rye. Conversely, rye reacted positively to inoculation with material from *B. erectus* and *L. perenne*. Stäger's finding that normal sclerotia are not formed on *M. nutans* was also contradicted, those produced on this grass being normal, though mostly small and concealed between the glumes. No reference was found in the papers consulted to the following species which were successfully inoculated: *B. tectorum*, *Elymus nutans*, *Festuca vaginata*, *Haynaldia hordeacea*, *Hordeum secalinum*, *Koeleria eriostachya*, *Phalaris nodosa*, *Sesleria budensis*, and *S. varia*.

The sclerotia of *C. purpurea* in the abundant material tested were found to vary greatly with their place of origin, the colour ranging from black to grey, with many transitional shades, while albino forms were occasionally encountered, as well as brown and cyclamen-red [see preceding abstract]. The shape also varied from short and thick to elongated. The discrepancies in alkaloid content between sclerotia of different provenance are well known, and the variability in host range may be equally wide. However, there is a certain limit to physiologic specialization in the fungus. For instance, it proved impossible to infect the hosts of *C. microcephala* [loc. cit.; 32, p. 565] with the rye material available for these experiments, while negative results were also obtained on rice, sorghum, *Panicum*, and *Setaria* spp.

Hårdh (J. E.). **Sokerimaissin viljelystä sekä sitä haittaavista tekijöistä.** [The cultivation of Sweet Corn and factors hampering it.]—*Maataloust. Aikakausk.*, 27, pp. 179–186, 1 fig., 1955. [English summary.]

Experiments were performed in 1953 and 1954 at the Agricultural Research Centre, Tikkurila, to determine the possibilities of maize cultivation in Finland. In both years Early Alberta was the earliest and most prolific of the nine varieties tested. Shrivelled grains germinated poorly and were frequently mouldy [cf. *R.A.M.*, 33, p. 664]. The principal inhibitors of growth seemed to be species of

Botrytis and *Hormodendrum*. Persistent rainy weather in 1954 favoured rotting of the ears, the tips of which yielded *B. cinerea*, *Fusarium anguioides*, *Gibberella saubinetii* [*G. zeae*], and *F. sambucinum*. *B. cinerea* and *F. sambucinum* proved to be capable of causing decay of the ear tips in inoculation experiments.

Malaguti (G.) & Stoner (W. N.). **'Psorosis' de las Citricas en Venezuela.** [Psorosis of *Citrus* spp. in Venezuela.] –*Agron. trop., Maracay*, 4, 3, pp. 127–149, 8 figs., 1954. [English summary.]

Citrus psorosis has been observed for the first time in Venezuela [C.M.I. map No. 65] affecting all the citrus species and varieties grown, incidence varying from a trace to almost 100 per cent. All the described variations of the disease appear to be present. Unless the current indiscriminate methods of propagation are replaced by a certified budwood programme commercial citrus production will be seriously endangered.

Klotz (L. J.), Calavan (E. C.), & DeWolfe (T. A.). **Leaf drop and copper spray damage to Citrus.**—*Calif. Citrogr.*, 41, 5, pp. 167–168, 188–189, 6 figs., 1956.

During the 1955–6 season copper damage caused considerable defoliation of citrus in some parts of California. Bordeaux and other copper sprays cause damage by release of an excess of soluble copper, and also by increasing transpiration and thus accelerating wilting. Reduction of photosynthesis in dull weather results in the accumulation of carbon dioxide, which in turn causes an increase of soluble copper, and this damages leaf surfaces moistened by dew or fog with no run off, the effect being increased with low temperatures and inadequate soil moisture. Various other causes of such injury have been suggested, such as the effect of increased ammonium in the leaf due to ammonium sulphate fertilizer, the aggravation of mechanical injury by copper, the use of oil sprays with or shortly after copper sprays, and possibly the effect of the chemicals in 'smog'. None of these, however, is consistently harmful or sufficient to cause extensive damage. Spray recommendations are given for brown rot [*Phytophthora* spp.] of citrus, including formulations for areas where copper injury occurs [*R.A.M.*, 35, p. 446].

Saccas (A. M.). **Recherches expérimentales sur la trachéomycose des Caféiers en Oubangui-Chari.** [Experimental researches on tracheomycosis of Coffee in Ubangui-Chari.]—*Agron. trop., Nogent*, 11, 1, pp. 7–38, 9 figs., 1 map, 1956. [English and Spanish summaries.]

Further investigations into tracheomycosis of *Coffea excelsa* and *C. robusta* trees, caused by *Gibberella xylarioides* [*R.A.M.*, 30, p. 228; 31, p. 63; 35, p. 182, *et passim*] in Ubangui-Chari, French Equatorial Africa, showed that penetration of the host occurs only through wounds in the aerial parts or the superficial roots. In trees over ten years of age the incubation period is usually more than eight months and frequently more than one year.

At the first sign of infection trees should be uprooted and burned *in situ*. To this end, all plantations should be regularly and frequently inspected, root rots in particular being noted and treated. The surface of the soil round the hole left after removal of an infected tree should be sprayed with 2·5 per cent. copper sulphate. The destruction of every focus of infection and the spraying of all the aerial parts at least three times a year with an insecticide with added copper should be obligatory and should be scrupulously carried out.

In tests of the resistance of 56 illegitimate F_1 lines of *C. excelsa* made from 1950 to 1955 with inoculum from *C. excelsa*, only 463 of 17,315 plants were 'presumed' resistant. In 33 other lines of the same origin represented by 9,263 bushes tested in 1955, 2,128 in 25 lines have so far resisted seven inoculations. Twelve successive tests with inoculum from *C. robusta* of 758 illegitimate F_1 and 765 illegitimate F_2

plants of line B 10 of *C. robusta* were carried out with no resultant mortality; this line is, therefore, considered to be resistant. Resistant strains are being multiplied. In line A445, 700 F_1 plants have resisted 12 inoculations; tests of the F_2 are to be made.

A bibliography of 32 titles is appended.

Sylvain (P. G.). **Le Café du Yémen.** [The Coffee of the Yemen.]—*Agron. trop., Nogent*, 11, 1, pp. 62–73, 8 figs., 1956. [English and Spanish summaries.]

In this account of the cultivation of *Coffea arabica* in the Yemen, Arabia, where the trees are grown under irrigated conditions, the author states that during a visit to a number of plantations he observed no disease that appeared of any economic importance. There was no sign of *Hemileia vastatrix*; the leaves of a few trees bore lesions caused by *Colletotrichum coffeanum* [*Glomerella cingulata*], but they were not numerous enough to constitute any real danger. Chlorosis, probably caused by iron deficiency, was common.

Presley (J. T.). **Cotton diseases and methods of control.**—*Fmrs' Bull. U.S. Dep. Agric.* 1745, 21 pp., 22 figs. (12 col.), 1954.

This bulletin replaces an earlier publication [cf. *R.A.M.*, 14, p. 628]. An account is given of the principal diseases of cotton in the United States, a number of which are illustrated in colour, and their control. The control measures for the major diseases, together with the causal organism, symptoms, and distribution in the United States, are finally summarized in tabular form.

Kulebyaev (V.). Селекция вилтоустойчивых сортов тонковолокнистого Хлопчатника. [Selection of wilt-resistant varieties of fine lint Cotton.]—Хлопководство [*Cotton Raising*], 6, 3, pp. 45–48, 6 figs., 1956.

In 1953 cotton wilt (*Fusarium vasinfectum*) [*R.A.M.*, 13, p. 93] was spreading rapidly in the Maruiisky region of the Turkmen Republic, U.S.S.R. Of the new varieties of fine lint cotton developed by the author at the Iolotan Experiment Station, Turkmen, the following were completely free from the disease on artificially inoculated plots in 1954: 8983–I, 9149–I, 9150–I, 9123–I, 9131–I, and 8322–I, while average infection in 9133–I, 8173–I, and 4844–I was less than 1 per cent., as against 40·1 per cent. for the standard variety 2IZ. In similar experiments in 1955 the following showed the highest resistance (less than 10 per cent. average infection as against 74·8 and 80·3 per cent. for the standard variety 2IZ): 9167–I, 9123–I, 9134–I, 9122–I, 9149–I, 8981–I, 9144–I, 9150–I, 9142–I, 9038–I, 9140–I, and 8173–I.

Méndez (D.). **Comportamiento de las selecciones Tangüis en suelos altamente infectados por el Verticillium wilt — 1951–52 y 1952–53.** [Behaviour of the Tangüis selections in soils highly infested with *Verticillium* wilt—1951–52 and 1952–53.]—*Bol. Exp. agropec., Lima*, 3, 4, pp. 5–12, 1954.

In view of the fact that cotton wilt (*Verticillium albo-atrum*) is a limiting factor in the production of cotton in the central coastal region of Peru [*R.A.M.*, 34, p. 722], comparative experiments were conducted in 1951–52 and 1952–53 in various regions using ten Tangüis selections grown in wilt-infested soil. In accordance with the results obtained line LM.W 395–42 is recommended for areas below the Chillón and Rímac valleys, and LM.W 467–45 and LM.W 12–40 for central Chillón areas and for early plantings below Chillón.

Moniz (L.), Thirumalachar (M. J.), & Patel (M. K.). **Technique for artificial inoculation of Cotton plants with Macrophomina phaseoli.**—*Curr. Sci.*, 25, 2, p. 64, 1 fig., 1956.

At the Plant Pathological Laboratory, Agricultural College, Poona, India, a

method was developed for inoculating potted cotton plants with *Macrophomina phaseoli* [*R.A.M.*, 34, p. 517]. The fungus was grown at 30° C. on a corn-meal sand medium in large, sterilized Kilner jars and the mycelial mats were carefully scooped out without damaging the mycelial strands. The inoculum was placed in close contact with the roots and covered with a thin layer of soil. The death-rate was highest with a 48-hour-old culture.

Kandaswamy (M.) & Subramanian (C. L.). **Seed treatment against black arm disease of Cotton.**—*Madras agric. J.*, 41, 5, pp. 134–140, 1954.

Blackarm disease of cotton (*Xanthomonas malvacearum*) [*R.A.M.*, 34, p. 517 *et passim*] has been prevalent in Madras for over 30 years. Pot experiments by the authors showed that seed dressings of agrosan GN and fernasan, 1 to 150 by weight for 15 mins., applied to artificially infected MCU1 seed delinted with sulphuric acid, reduced primary infection from 68·6 in the untreated control to 12·2 and 24·6 per cent., respectively, the former increasing germination and vigour. The farmers' custom of treating seed with cow dung or red earth prior to sowing did not reduce primary infection and affected germination adversely if these substances were used at strengths greater than 1 to 12 or 1 to 24, respectively.

In field experiments in 1952–3 with artificially infected MCU1 fuzzy seed treated with fernasan, agrosan GN, Y.F. 2776, and tritisan the percentages of primary infection were 5·13, 15·25, 18·13, and 38·75, respectively, compared with 36·63 for the control.

Ducker (H. C.). **Nyasaland Cotton Experiment Station, Chitala. Progress Report for the season 1954–55.**—*Progr. Rep. Exp. Stas Emp. Cott. Gr. Corp.* (*Nyasald*), *1954–5*, 10 pp., 1955.

On pp. 7–8 of this report [cf. *R.A.M.*, 34, p. 722] it is stated that the commercial cotton crop in the rain-fed areas of Nyasaland was grown entirely from seed treated with perecot against bacterial blight [*Xanthomonas malvacearum*: 35, pp. 277, 367], and the general health of the young plants was very good in all districts. In a trial at Chitala leaf and stem infections on plants from dusted seed were significantly lower than from the untreated at counts on 15th February and 12th March, 1955, but the final difference in yield was not significant.

Wickens (G. M.), Logan (C.), & Faulkner (R. C.). **Plant pathology. Plant Breeding.**—*Progr. Rep. Exp. Stas Emp. Cott. Gr. Corp.* (*Uganda*), *1954–5*, pp. 30–40, 1955.

In this report from the Cotton Research Station, Naumulonge, Uganda [cf. *R.A.M.*, 34, p. 644], it is stated that the 1954–5 season was marked by a low incidence of all phases of bacterial blight (*Xanthomonas malvacearum*) [35, p. 277] associated, apparently, with low temperatures early in the season and an absence of driving rainstorms and high winds later. In further inoculation experiments the Nigerian strain 26C/49160–23 BCP showed evidence of resistance. Data from other experiments indicated that the stems of strains V 135 and B 181 are appreciably less resistant to *Verticillium dahliae* [32, p. 375] at four than at six weeks of age. Further observations strongly supported the view that leaves infected by *V. dahliae* may provide an important means of carry-over of the fungus from one season to the next. The greatest loss from damping-off of seedlings due to *Rhizoctonia* [*Corticium*] *solani* occurred in early plantings but did not exceed 8 per cent. of the seed sown. A rapid, destructive black rot of the boll-wall appeared to be associated with a *Fusarium* sp.

In breeding work against *X. malvacearum* the proportion of resistant Albar 51 plants in many progenies was considerably lower than that found among their parents in the previous season. Uniform resistance occurred in only six of the 63

progenies derived from 34 strains homozygous for resistance in 1953–4. The best progenies of BP 52 contained only 50 to 60 per cent. resistant plants. In the F_2 of the hybrid (MU 8 × BP 52²) × Abar 51 the percentage of resistant plants varied from 10 to 50, with the highest proportion in crosses with the 474 strain of Albar 51. When strains of B 181 × BP 50 were inoculated with *X. malvacearum* and the susceptible plants removed most of the survivors showed resistance also to *V. dahliae*.

Anson (R. R.). **Aden Protectorate. Abyan Cotton Experiment Station, Progress Report for the season 1954–55.**—*Progr. Rep. Exp. Stas Emp. Cott. Gr. Corp. (Aden), 1954–5*, 8 pp., 1955.

In the section on cotton pests and diseases (p. 5) in the Aden Protectorate it is stated that wilt (*Rhizoctonia*) was much more conspicuous than before. In severely infected areas the loss of crop was estimated at 15 to 20 per cent. Leaf spot (*Cercospora gossypina*) and 'leaf rim blight' of [unspecified] fungal origin were much less severe than formerly.

Tanada (Y.). **Susceptibility of the imported Cabbageworm to fungi : Beauveria spp.** —*Proc. Hawaii ent. Soc.* 15 (*1954*), 3, pp. 617–622, 1 fig., 1955.

Investigations by the author at the University of California, Berkeley, and in Hawaii showed the susceptibility of the cabbage white larva (*Pieris rapae*) to *Beauveria bassiana* [*R.A.M.*, 34, p. 723; 35, p. 184] and *B. globulifera* [34, p. 646]. The symptoms on the larvae, which died within two to seven days after artificial infection, are described. Pupae more than one day old, and eggs, are resistant to attack by the fungi. Field observations in Hawaii disclosed a very small percentage of infection of *P. rapae* by *B. bassiana*, a new record for this area. Conditions at the time may not, however, have been optimum for the fungus.

Vago (C.) & Nicot (J[acqueline]). **Contribution à l'écopathologie comparée des mycoses à propos d'une nouvelle affection du Lépidoptère Bombyx mori L.** [A contribution to the comparative ecopathology of mycoses with respect to a new disease of the Lepidopteran, *Bombyx mori* L.]—*Rev. Mycol., Paris*, 19, 3, pp. 255–261, 1954. [Received 1955.]

In May, 1951, silkworms being raised on a large scale at Ales, Gard, France, became fatally infected by *Fusarium moniliforme* (*Gibberella fujikuroi*). The bodies of the affected insects hardened, and death occurred simultaneously. The dead insects were slightly yellowish. The white layer of spores covering the larvae was thin and silky and this appearance remained unchanged, even when sporulation was much advanced.

Inoculation of insects of the fourth instar, at 22° C. with a conidial suspension of the fungus, gave 66 per cent. positive results, showing that the fungus was only of average virulence. Inoculation by applying a spore suspension to the litter, the leaves, and the feet of the larvae demonstrated that infection largely depended on environmental factors. At 20° to 23°, with relative humidity 60 to 70 per cent., and an aeration rate of 1·2 cu. m. per second, mortality was greatly retarded and amounted to only 1 per cent. Inoculation by the same method at 28°, with 90 per cent. humidity, and 0·2 cu. m. air per second gave 18 per cent. mortality in six days, with all the symptoms found in natural infection.

The micro-climatic conditions in which the insects were being reared were very different from the conditions that prevailed outside; 300,000 silkworms were being raised in metal containers arranged in tiers and divided into compartments. In the containers the temperature ranged from 25° to 28°, humidity from 86 to 100 per cent., and the rate of aeration was only 0·05 cu. m. per second, sometimes almost zero.

Flor (H. H.). **Host-parasite interaction in Flax rust—its genetics and other implications.**—*Phytopathology*, 45, 12, pp. 680–685, 1955.

The pathogenicity of 67 F_2 cultures of a cross between races 6 and 22 of *Melampsora lini* was tested on 32 flax varieties selected at the North Dakota Agricultural Experiment Station [*R.A.M.*, 34, p. 300] as carrying single genes for rust reaction. The Bombay and J.W.S. varieties were resistant to all the F_2 cultures and Akmolinsk, Barnes, Bison, Victory, A. Wilden, and Williston Brown susceptible. On 23 of the 24 varieties on which the F_2 segregated the ratio of avirulent to virulent cultures approximated to the 3:1 to be expected if virulence on each was conditioned by a pair of recessive genes. On Ottawa 770B two pairs of genes may have been involved. In the 67 cultures 54 pathogenic races were identified.

Host-parasite interaction in *M. lini* may be explained by the assumption of a gene-for-gene relationship between response to rust in the host and pathogenicity in the fungus. Pustule type, the criterion of both reaction and pathogenicity, is conditioned by specific pairs of genes, one in the plant and the other in the parasite. In flax and *M. lini* 25 such gene pairs have been identified.

The gene-for-gene relationship between reaction and pathogenicity enables the recessive gene complement of a uredo culture to be established by the determination of its pathogenicity on differential varieties with single rust-conditioning genes. The homo- or heterozygosity of the dominant genes is ascertained by selfing the uredo culture. This method of identifying the pathogenic genotype of rust races makes it possible to use the biotype as the basic concept of race.

The gene-for-gene relationship also simplifies the development of resistant varieties and opens up fresh approaches to studies of the origin of new races, mutation for rust reaction in the host and virulence in the fungus, the evaluation of epidemiology data, and the nature of resistance.

Pietkiewicz (T. A.). **Badania mykologiczno-fitopatologiczne nad nasionami Lnu.** [Mycological-phytopathological studies on Flax seeds.]—*Acta agrobot.*, 3, pp. 223–277, 7 figs., 1 map, 1955. [English and Russian summaries.]

Colletotrichum lini [*C. linicola*: *R.A.M.*, 15, p. 279; cf. 35, p. 451] was the most common pathogen found on flax seed in Poland, followed by *Polyspora lini* [loc. cit.; 10, p. 597]. Species of *Alternaria* and *Macrosporium* were present in most of the samples. For reducing infection of flax seed the best cleaning and sorting machines are those like the 'Dossor', which operate on the principle of specific weight and friction coefficient.

Marshall (B. H.). **Some effects of inorganic nutrients on the growth and pathogenicity of five fungal pathogens of Gladiolus.**—*Phytopathology*, 45, 12, pp. 676–680, 1955.

At the Plant Industry Station, Beltsville, Maryland, *Fusarium oxysporum* f. *gladioli* [*R.A.M.*, 33, p. 296; 35, p. 368], *Stromatinia* [*Sclerotinia*] *gladioli* [loc. cit.], *Botrytis gladiolorum*, *Stemphylium* [cf. 35, p. 186], and *Curvularia lunata* [32, p. 433] were cultured in 18 different mineral-sucrose solutions, comprising some with nitrogen, phosphorus, and potassium in a two-level factorial design and others from which these elements, sulphur, magnesium, and the trace elements iron, zinc, copper, manganese, and molybdenum were omitted one by one. The pathogens did not appear to differ appreciably in their nutritional requirements from the various fungi of little or no economic importance which have commonly been used as test organisms previously. However, certain responses to trace element deficiencies or excesses are considered to justify further investigations in nutrient solutions of higher purity than those used in these experiments.

The inoculation of Picardy gladiolus foliage and corms with mycelium-spore suspensions prepared from fungus mats grown at the various nutrient levels failed

to establish any clear-cut correlation between the nutrient requirements of the several organisms and their pathogenicity.

Thomas (W. D.). **The effect of nutrient levels of Carnations on the activity of Carnation mosaic virus.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 6, p. 51, 1954.

At the Colorado A & M College the virulence of extracts of plants infected by carnation mosaic virus [*R.A.M.*, 30, p. 468; 32, p. 580] and treated with different levels of nitrogen, phosphorus, and potassium was determined by the local-lesion method on *Dianthus barbatus*. High nitrogen concentrations promoted the development of an inhibitor of the virus, but medium ones, combined with small quantities of phosphorus and potassium, favoured strong virus activity in the apical portions of the plants. Infectivity increased directly with rising levels of phosphorus. High concentrations of both potassium and phosphorus stimulated virus activity in the basal leaves.

Campbell (C. E.) & Dimock (A. W.). **Temperature and the geographical distribution of Chrysanthemum rust.**—*Phytopathology*, 45, 12, pp. 644–648, 2 figs., 1 graph, 1955.

At the Department of Plant Pathology, Cornell University, Ithaca, New York, the optimum temperature for the germination of chrysanthemum rust (*Puccinia chrysanthemi*) uredospores was found to range from 15° to 21° C., with a minimum at 6° and maximum at 30°. Infection of excised leaves floated on a 7 per cent. sucrose solution in covered Petri dishes [cf. *R.A.M.*, 13, p. 773] occurred between 15° and 27° but not at 6° or 30°. In lesions up to 12 days old the fungus was killed by 24 hours' exposure to an air temperature of 30° or eight hours at 38°; in incipient infections (up to 48 hours) it succumbed to a four-hour exposure at the latter temperature. Spores in uredosori were destroyed by four daily four-hour exposures to a temperature of 38°, while germination was reduced by nearly 90 per cent. by three such exposures at 38° or five at 30°. Leaf temperature in direct sunlight out-of-doors was found to exceed the ambient temperature by as much as 9°, so that in isolated leaves the pathogen might be eradicated at air temperatures conducive to its further development.

The results of these studies explain the limitation of severe damage by *P. chrysanthemi* [C.M.I. map No. 117] to those areas of North America where generally cool conditions prevail.

Messing (J. H. L.) & Owen (O.). **The visual symptoms of some mineral deficiencies on Chrysanthemums.**—*Plant & Soil*, 5, 2, pp. 101–120, 4 pl., 1954.

The authors give detailed descriptions of mineral deficiency symptoms in cuttings of 15 outdoor chrysanthemum varieties grown in sand culture at the Cheshunt Experiment Station, namely, those of nitrogen, phosphorus, potassium, calcium, magnesium, manganese, and boron [*R.A.M.*, 30, p. 139; 31, p. 224].

Baker (K. F.) & Durbin (R. D.). **Control of Pythium root rot of Aloe variegata by hot-water treatment.**—*Cactus & Succ. J., Los Angeles*, 28, 2, pp. 45–46, 2 figs., 1956.

The authors describe a root rot of *Aloe variegata* caused by *Pythium ultimum* which was responsible for a loss of several thousand seedlings in a nursery in Los Angeles, California. The disease starts at the root tips and spreads rapidly back to the stem. Infected plants which would normally be discarded may be treated by total immersion in hot water at 115° F. for 30 minutes. They are then placed in or sprayed with cold water, dried, and replanted. Even large seed-bearing specimens may be saved by this method, and in such cases the treatment time may be safely extended to 40 minutes.

Limited tests with *Haworthia attenuata* were equally successful.

Durbin (R. C.), Davis (Lily H.), & Baker (K. F.). **A Helminthosporium stem rot of Cacti.**—*Cactus & Succ. J., Los Angeles*, 28, 2, pp. 46–49, 2 figs., 1956.

This paper, dealing with the control of *Helminthosporium cactivorum* stem rot of cacti in southern California, has already been abstracted from another source [*R.A.M.*, 35, p. 191].

Montant (C.). **Cycle d'Endophyllum euphorbiae characiatis et morphoses provoqueés par le parasite sur son hôte.** [Life-cycle of *Endophyllum euphorbiae-characiatis* and the morphoses induced by the parasite on its host.]—*Bull. Soc. Hist. nat. Toulouse*, 89, pp. 128–136, 13 figs., 3 diags., 1954.

A full account is given of laboratory studies and *in situ* observations on *Endophyllum euphorbiae-characiatis*, a parasite of *Euphorbia characias* in the Nimes district of France, originally described by L.-T. Ngo in *Bull. Soc. mycol. Fr.*, 45, 1929. The rust is microcyclic and autoecious, producing spermogonia and aecidia in the spring, a perennating mycelium in the summer and autumn, and spermogonia again during the winter. Among the anomalies it induces are heterophylly, exfoliation, elongation, aberrant cladomania, and anatomical changes.

Ullstrup (A. J.). **Crazy top of some wild grasses and the occurrence of the sporangial stage of the pathogen.**—*Plant Dis. Reptr*, 39, 11, pp. 839–841, 3 figs., 1955. [Multilithed.]

In addition to some grass hosts already noticed [*R.A.M.*, 19, p. 12; 32, p. 554], *Eleusine indica*, *Eragrostis pectinacea*, and *E. cilianensis* were found to be infected by *Sclerospora macrospora* on the campus of Purdue University, Lafayette, Indiana. Sporangia developing sparsely on the leaves of *Digitaria sanguinalis* in a moist chamber resembled those found on a single maize plant severely affected by crazy top [35, p. 292] in a nursery near Lafayette, Indiana, and those described for *S.* (or *Sclerophthora*) *macrospora* on *Eleusine coracana* [32, p. 630].

Tyler (L. J.), Murphy (R. P.), & Macdonald (H. A.). **Effect of seed treatment on seedling stands and on hay yields of forage legumes and grasses.**—*Phytopathology*, 46, 1, pp. 37–44, 1956.

From 1950 to 1953, inclusive, the effects of fungicidal seed treatments against [unspecified] damping-off organisms on seedling stands and hay yields of lucerne, red clover, birdsfoot trefoil [*Lotus corniculatus*], orchard grass [*Dactylis glomerata*], smooth brome grass [*Bromus inermis*], Sudan grass, and timothy [*Phleum pratense*] were determined on field plots at Cornell University, Ithaca, New York, and in some outlying counties in the State. Plantings were made, usually during May but occasionally in early June, on soils varying in type, fertility, drainage, and cropping histories, the seed being generally broadcast, with or without a nurse crop of oats. Stand counts were made five to seven weeks later and the hay yields of the perennial species computed in their second growing season.

No benefit was derived from treatment with arasan (8 oz. per 100 lb. seed), phygon seed protectant (6 oz.), or orthocide 75 (6 oz.), the last-named used only in 1953, but neither was there any evidence that the chemicals reduced stands or yields.

Lebeau (J. B.) & Dickson (J. G.). **Physiology and nature of disease development in winter crown rot of Alfalfa.**—*Phytopathology*, 45, 12, pp. 667–673, 1 fig., 2 graphs, 1955.

This is an expanded account of a study, jointly reported from the Botany and Plant Pathology Division, Canada Department of Agriculture, and the Department of Plant Pathology, University of Wisconsin, and conducted at the Plant Pathology Laboratory, Edmonton, Alberta, on the relation of hydrogen cyanide production to the development of the low-temperature basidiomycete

responsible for crown rot of lucerne [*R.A.M.*, 33, p. 430]. Concentrations of up to 2,400 p.p.m. hydrogen cyanide were recovered from the diseased tissues of both dormant and active plants killed by the fungus under controlled conditions. The maximum synthesis of the compound in culture occurred at 12° C. and the best sources of nitrogen and carbon for mycelial growth were asparagine and sucrose, respectively. The pathogen entered the plant at the apex or base of the crown bud and proceeded to the crown and shoot tissues by way of the vascular system. No differential or defensive reactions to the fungus were detected in the host tissue.

Brakke (M. K.), Vatter (A. E.), & Black (L. M.). **Size and shape of wound-tumour virus.**—*Symp. Biol., Brookhaven*, 6 (Abnormal and Pathological Plant Growth), pp. 137–156, 12 figs., 1 diag., 1 graph, 1954. [Multilithed.]

In further studies of wound-tumour [clover big vein] virus [*R.A.M.*, 33, p. 299] high concentrations of the virus were obtained from sweet clover [*Melilotus* spp.: 35, p. 77] tumours, and with the aid of density gradient centrifugation (*Arch. Biochem. Biophys.*, 45, pp. 275–290, 1953) [cf. 30, p. 535], it has been possible to subject it to electron microscopy. The tumour extracts were found to contain approximately 100 times as much infective principle as tumour-free stem portions of the same plants, and were infective at a dilution of 10^{-5} when used with the vector *Agallia constricta*. Visible zones [loc. cit.] obtained after density gradient centrifugation of extracts from tumours or viruliferous vectors contained high concentrations of dense bodies, appearing as spheres in crude preparations, but as polyhedra approximately 80 mμ across in dried preparations; the virus from both sources was similar in appearance and had a sedimentation constant of approximately 600 Svedberg units.

A small percentage of crimson clover (*Trifolium incarnatum*) plants were successfully infected by pinprick inoculation with the sweet clover extracts of this virus, not previously transmitted mechanically.

Kobel (F.), Fritzsche (R.), & Bryner (W.). **Die Düngung der Obstbäume.** [The manuring of fruit trees.]—*Schweiz. Z. Obst- u. Weinb.*, 65, 6, pp. 119–128, 8 figs., 1956.

Guidance in the recognition of nitrogen, phosphorus, potassium, magnesium, boron, and zinc deficiency, and of excess lime symptoms is included in these useful instructions for the application of soil amendments in Swiss orchards.

Bussmann (A.). **Die Eisenchlorose.** [Iron chlorosis.]—*Schweiz. Z. Obst- u. Weinb.*, 65, 6, pp. 131–134, 5 figs., 1956.

Up-to-date information, based on 17 contributions to the relevant literature, is presented on the causes and cure of iron chlorosis, e.g., in fruit trees, small fruits, and vines, with special reference to the application of the results of these studies to Swiss conditions.

Fischer (H.). **Weitere Beobachtungen über ungewöhnliche Berostungen und Rißbildungen an Boskoop, Glockenapfel, und anderen Apfelsorten.** [Further observations on unusual russeting and cracking on Boskoop, Glocken, and other Apple varieties.]—*Schweiz. Z. Obst- u. Weinb.*, 64, 26, pp. 527–531, 4 figs., 1955.

Besides Beauty of Boskoop and Glocken, other apple varieties were affected in 1955 by the unusual forms of russeting and cracking already reported from the Wädenswil Experiment Station, Switzerland [*R.A.M.*, 35, p. 194]. On Berlepsch the irregular, dark brown, rough, very rusty spots of different sizes resembled those on Beauty of Boskoop but were generally smaller and fewer, while cracks of varying extent were formed on Glocken, Champagne Pippin, Ontario, Gravenstein, and Golden Delicious. The fissures were sometimes preceded on Glocken and Ontario by the development of irregular, slightly sunken, dark green spots.

No conclusive evidence of virus implication in the etiology of these symptoms has yet been obtained from grafting experiments.

Grosclaude (C.). **Produits nouveaux contre la cloque du Pêcher.** [New products against Peach leaf curl.]—Reprinted from *Rev. Zool. agric.* 10–12, 3 pp., 1 fig., 1954.

In experiments at the Plant Pathology Station of the South-West [France], using several of the newer fungicides, an oil-based cuprous oxide at 1 per cent. and a dinitrophenate at 0·3 per cent. gave good control of peach leaf curl (*Taphrina deformans*) [*R.A.M.*, 35, p. 376]. Excellent results were obtained in 1954 with 0·5 per cent. ferbam on the variety Mme Girerd in an orchard at Réolais, while captan, though ineffective on this variety, gave better control than ferbam on Charles Ingouf.

Verneau (R.). **La vaiolatura batterica del Albicocco.** [Bacterial spotting of Apricots.]—*Ric. fitop. Campan.*, 12, pp. 63–69, 1 pl., 1954. [English summary.]

An apricot disease affecting up to 80 per cent. of the crop in the Vesuvius region of Italy during 1954 was characterized by shot-holing of the leaves, minute round or slightly irregular lesions on the fruits, becoming reddish and finally black with a depressed centre and measuring 1 to 4 mm. [in diameter], and small cankers on the twigs. It differed from shot-hole caused by *Clasterosporium* [*carpophilum*], which was also present to some extent, in the production of a bacterial ooze from beneath the swollen lesions and the fact that the fruits were sometimes severely affected and the leaves hardly at all; the leaf perforations were, in general, irregular or elongated instead of round. The causal agent is tentatively identified as *Xanthomonas pruni*, not previously recorded in this part of Italy or on this host. Pathogenicity was established by atomizing peach and apricot fruits and leaves with a bacterial suspension. Peach leaves were also attacked in the same area, but less severely. The Baracca and Boccuccia apricot varieties were the most susceptible, Ronson moderately so, and S. Francesco the least. In preliminary control experiments the trees were sprayed at ten-day intervals from petal-fall with 1·5 per cent. zinc sulphate and lime.

Jacks (H.) & Brook (P. J.). **Control of Fabraea-scald of Quinces.**—*Orchard. N.Z.*, 27, 8, pp. 3, 5, 2 figs., 1954.

Experiments carried out from 1952 to 1954 on control of *Fabraea maculata* on quinces in New Zealand [*R.A.M.*, 26, p. 330] indicated that after an initial spray with 10–8–100 Bordeaux mixture, at bud movement, thiram or captan, both at 2 lb. per 100 gals., might profitably replace it for the subsequent four or five sprays at fortnightly intervals. Colloidal copper and copper oxychloride are not recommended on account of the fruit damage caused by them.

Chamberlain (G. C.) & Putman (W. L.). **Diseases and insect pests of the Raspberry in Canada.**—*Publ. Canad. Dep. Agric.* 880, 34 pp., 28 figs., 1955.

This bulletin is essentially a revision of the previous edition [*R.A.M.*, 32, p. 323], amended to include some references to the same diseases on blackberry, loganberry, and other cane fruits.

Bazán de Segura (Consuelo). **Problemas fitopatológicos actuales del cultivo del Plátano en Tumbes.** [Current phytopathological problems concerning Plantain cultivation in Tumbes.]—*Inf. Estac. agríc. La Molina* 92, 18 pp., 1954. [English summary. Mimeographed.]

A survey of plantain diseases in the Tumbes Valley, Peru, revealed that abundant rainfall in the northern part during 1953 favoured a localized attack of Sigatoka

disease (*Cercospora musae*) [*Mycosphaerella musicola*: *R.A.M.*, 32, p. 634], confined to the lower leaves. In August, 1954, however, it had disappeared almost completely. A root abnormality of Gros Michel bananas in the lower part of the valley, characterized by progressive leaf-yellowing and withering until the plant died, was due to flooding and compaction of the soil, rendering the roots susceptible to attack by various pathogens.

GRANITI (A.). **Lotta stagionale contro alcune malattie delle piante.** [Seasonal control of some plant diseases.]—Reprinted from *Tecn. agric.* 11–12, 2 pp., 1954.

Further experiments on the control of olive 'leprosy' in Sicily caused by *Gloeosporium olivarum* [*R.A.M.*, 35, p. 110], conducted at the Plant Pathology Institute, Catania, demonstrated that two applications of 1 per cent. Bordeaux mixture, one at the end of October and another at the end of November, should give satisfactory protection. [In *Ital. agric.*, 91, 12, pp. 945–948, 1954, the author recommends the sprays to be given at the beginning of these months, not the end.]

Scab (*Fusicladium eriobotryae*), the most serious disease of medlar in southern Italy [cf. *R.A.M.*, 25, p. 493; 33, p. 208], may be controlled by plant sanitation combined with applications of 1 per cent. Bordeaux mixture to the young leaves and after flowering, and also of copper oxide sprays to the young fruits immediately after petal fall and every 20 days thereafter until maturity.

As regards almond diseases, damage from gummosis (*Coryneum beijerinckii*) [*Clasterosporium carpophilum*: 25, p. 493], withering of the twigs (*Monilia* [*Sclerotinia*] and *Phomopsis* spp.), which occurs frequently in Sicily, and other pathogens such as *Nectria* and *Taphrina*, are all checked by the destruction of affected twigs and fruits and a pre-floral spray with 2 per cent. Bordeaux mixture.

GRANITI (A.). **Prime osservazioni di campo sul comportamento delle varietà di Olivo della Sicilia orientale alla defogliazione anticipata.** [Preliminary field observations on the reaction of the Olive varieties in eastern Sicily to premature defoliation.]—Reprinted from *Olivicoltura* 10, 4 pp., 1954.

A survey of the incidence of premature defoliation of olive trees in eastern Sicily, caused by *Cycloconium oleaginum* [*R.A.M.*, 33, p. 739], revealed that the varieties Moresca and Ogliarola Messinese were highly susceptible, Biancolilla, Tonda Iblea, Giaraffa, Santagatese, and Santagostino moderately so, Nocellara Etnea, Nocellara del Belice, and Verdello only slightly so, and Zaituna, Calatina, and Minuta resistant. Moresca, Biancolilla, and Calatina were particularly susceptible to *Cercospora cladosporioides* [loc. cit.], which is often associated with *Cycloconium oleaginum*; Ogliarola Messinese, Tonda Iblea, and Nocellara Etnea were less so.

MOREAU (C.). **Les maladies parasitaires des principales cultures coloniales. Revue bibliographique. XVI.** [The parasitic diseases of the principal colonial crops. A bibliographical review. XVI.]—*Rev. Mycol., Paris*, 20, *Suppl. colon.* 2, pp. 144–159, 1955.

Further notes are given on the principal diseases of colonial crops [cf. *R.A.M.*, 35, p. 474], based on the literature (118 titles) published from 1953 to 1955.

VAN DEN ENDE (G.). **De reacties van verschillende waardplanten bij aantasting door Verticillium spp.** [The reactions of various host plants to infection by *Verticillium* spp.]—Abs. in *Tijdschr. PlZiekt.*, 62, 1, p. 21, 1956.

At the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, the author investigated the possibilities of physiologic specialization in *Verticillium albo-atrum* [cf. *R.A.M.*, 33, p. 545; 34, p. 496] and *V. dahliae*, the incidence of

infection by which is steadily increasing in Holland, e.g., on lucerne, flax, beet, and spinach. Cross-inoculation experiments with strains of *V. dahliae* from ash, elm, tomato, and potato gave positive results on ash and potato, with recovery of the fungus. The elm seedlings reacted negatively to all the strains. The initial growth of tomato seedlings was retarded by all four isolates; those from tomato, elm, and potato were recovered from the stems up to a height of at least 30 cm., whereas the ash strain could be obtained only from the roots.

Ten ash (*Fraxinus excelsior*) trees of the Doorenbos 5 variety were inoculated through the soil with each of 16 strains of both *V.* spp. isolated from nine different hosts, resulting in the development of 0 to 70 per cent. infection. In other tests, in which the inoculum was introduced through wounds in the stem base, all the 16 isolates caused 100 per cent. infection.

The weeds *Chrysanthemum leucanthemum*, *Solanum nigrum*, *Urtica urens*, and *Fragaria vesca* were inoculated with isolates of *V.* spp. from beet, chrysanthemum, and Oberschlesien strawberry. Only *U. urens* and *F. vesca* showed symptoms (in the form of stunting), but the pathogens were recovered from all four hosts.

It is concluded from these observations that specialization does not exist in the various strains and types of *V. albo-atrum* [cf. 12, p. 117] and *V. dahliae*, some hosts of which are tolerant and without external symptoms. Soil infection may develop even where the crops and weeds are apparently healthy, indicating the advisability of a judicious rotation and keeping the fields clean [13, p. 369].

Nichols (C. W.), Alstatt (G. E.), & Nakayama (R. M.). **Phymatotrichum (Ozonium) root rot.**—*Bull. Calif. Dep. Agric.*, 44, 4, pp. 171–176, 1 col. pl., 3 figs., 1955.

This is a general note on root rot, caused by *Phymatotrichum omnivorum*, as it occurs in California [*R.A.M.*, 12, p. 516; 13, p. 633]. Hosts not previously recorded in California [loc. cit.] include carrot [cf. 27, p. 185], fig, and olive.

Khan (A. H.). **Dematophora root rot.**—*Bull. Calif. Dep. Agric.*, 44, 4, pp. 167–170, 4 figs., 1955.

The author describes *Dematophora* (*Rosellinia necatrix*) root rot in apple [*R.A.M.*, 33, p. 490], and reports studies in California from 1946–48 on the susceptibility of a broad range of plants to the disease. Perithecia have not been encountered in the field in California, and the conidia appear to play no part in the spread of the fungus. The plants studied were exposed to the fungus in greenhouses, box cultures in the open, and field plots in old infected orchards. Isolates from apple, cherry, peony, pear, and walnut, used as inoculum, did not vary appreciably in their pathogenicity. Moderate susceptibility was found in lucerne, almond, apple, apricot [38, p. 527], blackberry, cherry, citrus, cotoneaster, fig, grape, peach, pear, quince, strawberry, and walnut. Marianna and Myrobalan plums grew vigorously in infected field plots. Lettuce grew well on land where all apple trees had been killed by the fungus. Twenty two chemicals, including allyl bromide, carbon disulphide, chloropicrin, ethylene dibromide, and formaldehyde, were tested for activity against the fungus in soil in metal containers. None was effective at economic levels of application.

Papazian (H. P.). **Sex and cytoplasm in the fungi.**—*Trans. N.Y. Acad Sci.*, Ser. II, 18, 4, pp. 388–397, 1 fig., 1 diag., 1956.

This survey of some important landmarks in the history of the cytology of fungi since the beginning of the present century is based on 21 contributions to the literature (including three by the author).

HEIM (PANCA). **Observations sur le noyau des Basidiomycètes.** [Observations on the nucleus of the Basidiomycetes.]—*Rev. Mycol., Paris*, 19, 3, pp. 201–249, 3 pl. (1 col.) [following p. 280], 1954. [Received 1955.]

An account is presented of studies conducted at the Laboratory of Plant Biology of the Sorbonne, Paris, on the structure of the nucleus in the Basidiomycetes, including the Protobasidiomycetes, the Gymnocarps, the Agaricaceae, and the Angiocarps, with details of the nuclear divisions, spindles, and nucleolus in the Basidiomycetes, and chromosome numbers. In general, nuclei of the same size are almost exactly alike, except for a slightly denser network in species with a high chromosome number. In this respect the fungi differ from higher plants, in which there are distinct nuclear types even though the chromosome numbers are equal and the size of the nuclei is the same: the differences of structure in the higher plants consist in the chromosome dimensions. In the fungi there is no relationship between the nuclear organization and the class, family, or genus. It is peculiar to the species.

CARMICHAEL (J. W.). **Lacto-fuchsin : a new medium for mounting fungi.**—*Mycologia*, 47, 4, p. 611, 1955.

Mounts made with lacto-fuchsin, prepared by dissolving 0·1 gm. of acid fuchsin in 100 ml. of lactic acid, the acid being as free from water as possible, are superior to those prepared with lactophenol-cotton blue in that the cell walls are more distinct, staining is more rapid, and the colour is more suitable, especially for photography. Mounts made with a mixture of lacto-fuchsin and Gurr's 'water mounting-medium' (G. T. Gurr, London, S.W. 6, England) in equal proportions become firm enough to clean in a day or two.

CICCARONE (A.). **Idrocarburi non saturi, quali causa indiretta di danni alla vegetazione.** [Unsaturated hydrocarbons, as the indirect cause of plant damage.] —Reprinted from *Ital. agric.* 10, 3 pp., 1 fig., 1954.

The author discusses briefly the history and current problems with regard to smog injury in plants [*R.A.M.*, 35, p. 98].

ZIMMERMAN (P. W.) & HITCHCOCK (A. E.). **Susceptibility of plants to hydrofluoric acid and sulfur dioxide gases.** –*Contr. Boyce Thompson Inst.*, 18, 6, pp. 263–279, 4 figs., 1956.

At the Boyce Thompson Institute for Plant Research, New York, the effects of hydrogen fluoride and sulphur dioxide were determined and compared on 49 plant species [*R.A.M.*, 33, p. 548; 35, p. 98], using portable greenhouses for fumigating field-grown and potted plants, and stationary cabinets. The plants most susceptible to hydrogen fluoride, viz., *Solanum pseudo-capsicum*, gladiolus, tulip, *Sorghum* sp., *Ixora* sp., and maize, were resistant to sulphur dioxide, the reverse being true for chicory, eggplant, geranium, *Amaranthus retroflexus*, tobacco, *Taraxacum officinale*, and celery. In tests with hydrogen fluoride the plants were usually exposed for six to eight days to concentrations ranging from less than 1 to 100 p.p. billion [1,000 million], while the time of exposure to 0·2 to 1·1 p.p.m. sulphur dioxide was two to eight hours. Leaf susceptibility varied according to the species, the age of the tissue, and the gases involved. All the species grown in pots or under field conditions stored fluorine, *Cornus florida*, *Deutzia* sp., *Dichapetalum cymosum*, and *Camellia* sp. accumulating abnormally large amounts in the leaves. There were considerable differences in the rates of absorption by different species and the amounts absorbed by different parts of the plant.

The symptoms produced by the two gases differed sufficiently for each to be identified; this should aid in diagnosing symptoms in industrial areas.

Ruibakova (Mme S. G.). β-нафтол в борьбе с плесневыми грибами поражающимы различный клей бумаге и картоне. [β-Naphthol for the control of mould fungi attacking different sizes on paper and cardboard.]—Микробиология [*Microbiology, Moscow*], 24, 5, pp. 608–610, 1955.

At the Scientific Research Laboratory of the Lenin State Library, U.S.S.R., the addition of β-naphthol to the size used (the concentrations being based on the dry weight and type of size) effectively controlled moulds on paper and cardboard [see next abstract] caused by species of *Aspergillus*, *Trichoderma*, and *Stemphylium*.

Nyuksha (Y. P.). Некоторые причины порчи Книг. [Some reasons for spoilage of books.]—Природа [*Nature = Priroda, Moscow*], 44, 11, pp. 94–96, 3 figs., 1955.

Fungi, particularly moulds, are stated to be one of the most important factors responsible for the deterioration of library books in the U.S.S.R. [cf. *R.A.M.*, 35, p. 211]. Over 200 species are reported to be present in the libraries at the moment, species of *Cladosporium*, *Gymnoascus*, *Chaetomium*, *Trichoderma*, *Stachybotrys*, *Stemphylium*, *Sporotrichum*, *Penicillium*, and *Aspergillus* being the most destructive. Experiments showed that the spores remain viable on books for from four to six or even ten years.

Preventive measures are important in the control of moulds. Thus, adding disinfectants, such as thymol, formalin, β-naphthol, sodium pentachlorophenolate, or phenyl oxide, to the glue renders the latter unfavourable to mould development [see preceding abstract]. Formalin vapour disinfection of books is practised in most libraries. Systematic dusting and the maintenance of normal air humidity of 45 to 60 per cent. at temperatures of 16° to 20° [C.] are obligatory.

Crowdy (S. H.) & Pramer (D.). **The occurrence of translocated antibiotics in expressed plant sap.**—*Ann. Bot., Lond.*, N.S., 19, 73, pp. 80–86, 1 fig., 1 diag., 1955. [Received April, 1956.]

At the Butterwick Research Laboratories, Welwyn, Herts, a procedure was devised for readily extracting 53 to 74 per cent. of total plant water as expressed sap, using a convenient press, details of which are provided. The uptake and translocation of antibiotics by higher plants [cf. *R.A.M.*, 33, p. 681] was studied from assays of the expressed sap. The concentrations of griseofulvin and chloramphenicol absorbed from solutions and detected by this method in leaves of broad bean, tomato, lettuce, cabbage, and wheat plants did not differ significantly from the values obtained by assaying water extracts. Extraction with organic solvents of leaves from broad bean plants grown in griseofulvin solutions demonstrated a far greater antibiotic content than given by assays of expressed sap. To explain this difference a 'free' antibiotic fraction, obtainable in expressed sap or water extracts, and a 'bound' fraction recovered from the leaf only by organic solvent extraction are postulated.

Backus (M. P.) & Stauffer (J. F.). **The production and selection of a family of strains in Penicillium chrysogenum.**—*Mycologia*, 47, 4, pp. 429–463, 3 figs., 1 diag., 1955.

In further work at the University of Wisconsin on the 'Wisconsin Family' of *Penicillium chrysogenum* strains, yields of 3,000 O.U. per ml. of penicillin were obtained from certain variants in the 'nitrogen mustard branch' of the pigmentless series [*R.A.M.*, 33, p. 546]. This is more than ten times the amount produced under the same conditions by strain Q 176 and about forty times that given by the wild-type ancestor.

Wilde (S. A.). **Mycorrhizal fungi : their distribution and effect on tree growth.**—*Soil Sci.*, 78, 1, pp. 23–31, 1954. [Received October, 1955.]

The author gives a general summary of work carried out at the University of

Wisconsin in connexion with the afforestation of chernozem [black earth], prairie, and marsh soils. This work was initiated when it was found that conifers grown from seed in prairie soils failed to develop after producing their first whorl of leaves, though they did well when leaf mould containing mycorrhizal fungi was added.

Mycorrhizal organisms are very persistent in soils which have once had a forest cover, and are only eradicated from them by severe agencies, such as fires in peat deposits, prolonged waterlogging, and heavy applications of certain fungicides and insecticides. This persistence finds expression in the credo 'once a forest soil, always a forest soil'.

Seedlings raised in forest soils did well when transplanted into prairie soil even though mycorrhizal short roots and internal mycelia were not present. Work on the nature of the rhizosphere indicates that the development of ectotrophic or endotrophic mycorrhiza is only an incidental detail in the broader relationship of rhizosphere symbiosis [*R.A.M.*, 33, p. 687; 34, p. 180).

Peridsky and Wilde [in the press] have found that volatile substances produced by different kinds of humus have a marked influence on the development of excised root systems. In prairie soils mycorrhizal fungi are confined to a narrow fringe, seldom exceeding 200 ft., along the margins of forest land. It is noteworthy that their survival in prairie soils may be prevented by toxic and antibiotic secretions from prairie plants (*Bull. Torrey bot. Cl.*, 77, pp. 187–191, 1950).

Gentile (A. C.). **Carbohydrate metabolism and oxalic acid synthesis by Botrytis cinerea.**—*Plant Physiol.*, 29, 3, pp. 257–261, 1954.

Experiments at the Department of Botany, University of Chicago, indicated that glucose is oxidized directly to gluconic acid by *Botrytis cinerea* [*R.A.M.*, 35, p. 385], and then via intermediate steps to pyruvate. The fungus does not produce carbon dioxide or lactic acid anaerobically. A Krebs cycle appears to function. Inhibition of respiration with azide suggests that the terminal oxidase system is entirely mediated by heavy-metal enzymes.

B. cinerea synthesizes oxalic acid, mostly in the first week of growth and especially when it is in a phase of high oxidation, but the fungus cannot use the acid as a substrate for nutrition or respiration.

Taha (E. E. M.) & Sharabash (M. M.). **Utilization of xanthin by mould fungi.**—*Nature, Lond.*, 177, 4509, pp. 622–623, 1956.

Experiments in the Microbiological and Enzyme Chemistry Department, National Research Council of Egypt, using a basic Czapek-Dox medium in which the sodium nitrate was replaced by nitrogen-equivalent amounts of xanthin, indicated that many mould fungi, including *Aspergillus niger*, *Fusarium semitectum*, *F. niveum*, *F. sambucinum*, *F. oxysporum*, *F. moniliforme* [*Gibberella fujikuroi*], *F. equiseti*, and *Alternaria tenuis*, are able to grow well and utilize xanthin as the sole nitrogen source.

Loprieno (Nicola). **Breve nota sul comportamento di alcuni funghi di fronte allo L-triptofano.** [Brief note on the reaction of some fungi to L-tryptophane.] —*Agricoltura ital.*, 54 (N.S. 9), pp. 275–279, 2 figs., 1954.

When ten species of fungi, mostly plant pathogens, were grown at the Institute of Plant Pathology and Agricultural Microbiology, University of Pisa, on plain Czapek-Dox liquid, the addition of 0·25 per cent. L-tryptophane did not affect the development of any of the fungi adversely; some in fact used it as the nitrogen source. But when the amino-acid was substituted for sodium nitrate, *Ustilago zeae*, *Botryodiplodia malorum* [*Physalospora mutila*: *R.A.M.*, 27, p. 369], *Fusarium lini*, *Phomopsis viticola*, and *Verticillium albo-atrum* produced hardly any growth. Morphological changes induced in some species by the modified media are noted.

Bercks (R.) & Gehring (F.). **Untersuchungen über die Bukettkrankheit der Kartoffel.** [Studies on the bouquet disease of the Potato.]—*Kartoffelbau*, 6, pp. 130–131, 1955. [Abs. in *Zbl. Bakt.*, Abt 2, 109, 5–8, p. 192, 1956.]

In preliminary work [at the Institute for Virus Serology, Brunswick, Germany], on the preparation of an antiserum against the bouquet (tobacco ring spot) virus of potato [*R.A.M.*, 32, p. 274], the mechanical inoculation of potato leaves resulted in the prompt development of circular, strongly necrotic lesions, hitherto observed only on tobacco. In grafting experiments with material from bouquet-diseased tomato on healthy potato plants of 11 varieties similar symptoms were also the rule. In severely infected leaves the virus could be clearly demonstrated by serological methods, whereas those with milder symptoms reacted negatively. In 1954 the symptoms already observed in the greenhouse were also found in field crops and shown to be due to potato bouquet virus. Formerly they were evidently attributed to a fungal disease, so that existing records of bouquet virus on potato are likely to be very incomplete.

Bercks (R.). **Über die Haltbarkeit von angetrockneten Seren.** [On the stability of dried sera.]—*Phytopath. Z.*, 25, 4, pp. 445–447, 1956.

The results of further studies at the Institute for Virus Serology, Brunswick, Germany, demonstrated that potato virus X antisera dried on paper [*R.A.M.*, 28, p. 413] remain completely stable over a period of at least four years at a concentration of 0·2 ml. per 12 sq. cm. and in part also at 0·05 and 0·1 ml.

Rozendaal (A.). **Gezonde nakomelingen van viruszieke Aardappelen.** [Healthy progony of virus-diseased Potatoes.]—Abs. in *Tijdschr. PlZiekt.*, 62, 1, p. 28, 1956.

Potato plants of varieties hypersensitive to virus A and stipple-streak [potato virus Y] react to tuber and stem inoculation by the development of necroses, but their progeny are healthy. In general, however, naturally virus-diseased parent plants produce infected offspring, with the exception of those harbouring the stem-mottle virus [*R.A.M.*, 28, p. 85]. It has been observed in Holland that completely infected tubers may give rise to wholly or partially stem-mottled or to absolutely healthy plants, and the question arose whether stringent selection would lead to comparable results in the case of 'normal' viroses. Imported tubers of the Allerfrüheste Gelbe variety, carrying besides the ever-present virus A a high percentage of leaf roll and virus Y, combined in some instances with viruses X and S [see next abstract], were rigorously selected at Groningen until all but virus A were eliminated. The next step was to find families infected by the most attenuated strain of the virus, and ultimately the goal of complete freedom from its presence was reached [35, p. 273]. A possible explanation of the mechanism of elimination is that one of the sprouts produced by a diseased tuber by some means escaped infection. Such a case was observed under controlled conditions during 1955, when a Bintje tuber with secondary leaf roll gave rise to a single entirely healthy stem among a number of diseased ones.

Wetter (C.) & Brandes (J.). **Untersuchungen über das Kartoffel-S-Virus.** [Studies on Potato virus S.]—*Phytopath. Z.*, 26, 1, pp. 81–92, 1 fig., 2 graphs, 1956.

This is an expanded account of electron-microscopic studies on potato virus S [*R.A.M.*, 35, p. 273] at the Institutes for Virus Serology and Agricultural Virus Research, Brunswick, Germany, containing the following information in addition to that already presented from another source [34, p. 389]. Three groups of S strains were differentiated on the basis of pathogenicity to tomato and capacity to induce local lesions on *Gomphrena globosa*, viz., Rozendaal's [32, p. 145], Köhler's

D 1102 [34, p. 807], and one from King Edward [29, p. 427], a carrier of potato paracrinkle virus, with which S may possibly be identical. Determined by serological methods and inoculation on tomato and *Solanum demissum*, the thermal inactivation point lay between 60° and 65° C., or between 65° and 70° with *G. globosa* as the test plant.

Taylor (C. F.), Smoot (J. J.), Quinn (D. O.), Rohde (R. A.), & Elliott (E. S.). **Effect of brief exposures at 40° C. on germination of sporangia of Phytophthora infestans.**—*Phytopathology*, 45, 12, pp. 673–675, 2 graphs, 1955.

At Camp Detrick, Frederick, Maryland, a preliminary exposure of sporangia of *Phytophthora infestans* from 10- to 14-day-old cultures on Lima bean agar to a temperature of 40° C. for one to 20 minutes accelerated the rate of production of germ-tubes on groundnut hull extract agar [*R.A.M.*, 27, p. 195], though causing delay, proportional to the duration of exposure, in the beginning of the process. The maximum germination resulted from five minutes' exposure, followed by a rapid decline after longer periods of heat treatment. There was a marked reduction in the percentage production of zoospores in water after a heat exposure of even one minute.

Uhlig (S.). **Das Problem der Phytophthora-Warnungen.** [The problem of *Phytophthora* warnings.]—*Z. Acker- u. PflBau*, 99, 2, pp. 129–150, 8 graphs, 1955.

This is a further critical study and discussion of the problem of forecasting outbreaks of potato blight (*Phytophthora infestans*) in various centres of western Germany [*R.A.M.*, 34, p. 393]. Most of the contributions listed in the bibliography have already been noticed in this *Review*.

It is considered practicable to fix 'critical meteorological periods' which may be assumed with reasonable certainty to coincide with the 'main infection periods'. Each 'critical meteorological period' separated from another such period by more than four days will produce one generation of the fungus. From three to five generations are necessary to extend the few small initial foci of infection over a wide area. A graph representing the intensity of infection takes the form of a flight of steps, each increasing in size. In general, no warnings need be issued before the third step is reached. Critical periods developing before the end of the early potato crop are regarded as only 'half periods'. The rise of the infection graph cannot be prevented by spraying but it may be considerably lessened. Helpful in the execution of spraying operations are the current notifications of critical periods following the first warning.

In conclusion it is emphasized that the formation of primary foci and the spread of blight do not depend on meteorological factors alone. The warning service requires help in the form of prompt reports of phenological observations on the biology of the pathogen in relation to macroclimatic conditions [cf. 35, p. 319].

Calzada Benza (J.) & García Pittmann (E.). **Fungicides for the control of Phytophthora infestans.**—*Agronomía, Lima*, 21, pp. 31–33, 1955. [Abs. in *Chem. Abstr.*, 50, 5, col. 3699, 1956.]

In field experiments at the National College of Agriculture, Lima, Peru, the best control (77·5 per cent.) of potato blight (*Phytophthora infestans*) [*R.A.M.*, 33, p. 554], the highest yields, and the most economical results were obtained by fortnightly to monthly applications of 1 per cent. Bordeaux mixture, commencing on the 45th day after planting. Of the other sprays tested, 0·25 per cent. parzate ranked next in general efficiency, followed in decreasing order by 1 per cent. Bordeaux mixture with 0·12 per cent. spreader-sticker, 0·5 per cent. copper compound A, 0·5 per cent. tribasic copper sulphate, and 1 per cent. Bordeaux plus 0·5 per cent. DDT.

Świeżyński (K.). **Nowa metoda selekcjonowania Ziemniaków na odporność na zarazę ziemniaczaną (Phytophthora infestans de Bary).** [A new method of selecting Potatoes for resistance to blight infection (*Phytophthora infestans* de Bary).]—*Acta agrobot.*, 3, pp. 13–26, 3 figs., 1955. [English and Russian summaries.]

A method for determining the degree of resistance to *Phytophthora infestans* in potato varieties [cf. *R.A.M.*, 35, p. 318] is described from Poland. Seedlings grown on moist blotting paper are inoculated by immersing them in spore suspensions of the fungus at various concentrations. Susceptible seedlings are killed and the resistant ones survive, while degrees of resistance can be demonstrated. More than 10,000 seedlings can be tested within three weeks on a surface of 1 sq. m. The method is particularly useful for the rigorous selection often required in potato breeding, but too high a spore concentration should be avoided as even resistant seedlings may be killed.

Ylimäki (A.). **Perunasyövän levinneisyys ja torjunta Suomessa.** [The distribution and control of Potato wart in Finland.]—*Maataloust. Aikakausk.*, 27, pp. 199–220, 1 map, 1955. [German summary.]

During the 30 years ending in the autumn of 1954 plant protection officials have detected *Synchytrium endobioticum* on potatoes in Finland [*R.A.M.*, 34, p. 478] in 582 sites in 59 parishes covering a total area of over 4,760 ha., located principally in the south-west, south, and east of the country. The percentages of foci in urban and rural areas were 62·3 and 37·7, respectively.

Up to 1944 the isolation of infected stands was accomplished by enclosure and turfing. When it was demonstrated, however, that the pathogen retained its viability for at least 25 years in fallow ground (*Maatalous, 1944*, 9, pp. 168–172, 1944) [cf. *R.A.M.*, 35, p. 221] the infected areas were kept under grass for three to five years while only resistant varieties were cultivated in the vicinity. At the time of writing there were 24 parishes so heavily contaminated that it was illegal to supply them with seed of susceptible varieties for cultivation. In 1950, 13 resistant varieties were plentifully available in Finland, namely, Rosafolia, King George V, Paul Wagner, Ben Lomond, Great Scot, Majestic, Alpha, Ostbote, Juli, Pepo, Frühnudel, Sieglinde, Parnassia, and Frühgold, which were grown over an area comprising 31·6 per cent. of the total. Their range will undoubtedly be extended in consequence of a decision by the competent authorities that resistant varieties are to be exclusively cultivated all over the country except in Lapland, Oulu, and Vaasa.

Błaszczak (W.). **Wpływ terminu zaprawiania Ziemniaków porażonych przez ospowatość kłębów (Rhizoctonia solani Kuehn) na szybkość wschodów i zdrowotność kiełków.** [The effect of the date of disinfecting Potatoes infected by black scurf (*Rhizoctonia solani* Kuehn) on the rapidity of germination and health of the sprouts.]—*Acta agrobot.*, 2, pp. 21–38, 3 figs., 1 diag., 3 graphs, 1954. [English and Russian summaries.]

In experiments in Poland on the disinfection of potato tubers against *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, 35, p. 222 and next abstract] healthy and infected tubers were treated on 2nd December, 1952, and on 4th February and 8th April, 1953, with 0·1 per cent. mercuric chloride solution for 1½ hours or 0·8 per cent. formalin for two hours [cf. 34, p. 745]. The date of disinfection was apparently of great practical importance, the December treatment resulting in the highest proportion of healthy sprouts. On the whole, mercuric chloride was more effective than formalin.

Kulmatycka (I.), Leszczenko (P.), & Malec (K.). **Rizoktonioza Ziemniaków.** [*Rhizoctonia* disease of Potatoes.]—*Acta agrobot.*, 3, pp. 27–43, 3 figs., 1955. [English and Russian summaries.]

A brief review is given of some literature (10 titles) on *Rhizoctonia* [*Corticium*] *solani* on potatoes [see preceding abstract]. At the Potato Disease Research Station of the Institute of Plant Breeding and Acclimatization near Bydgoszcz, Poland, most of the varieties examined from 1951 to 1953 were susceptible, with the exception of Lenino, Panna, and Unikat which were fairly resistant. The severity of the disease can be reduced by proper agricultural practices and conditions allowing rapid sprouting and vigorous growth.

Ten Boer (H.). **Rizoctonia-enquête.** [*Rhizoctonia* inquiry.]—*Landbouwvoorlichting*, 13, 3, pp. 126–131, 3 figs., 1956.

The following conclusions were reached on the basis of 200 replies to a questionnaire circulated to all growers of Bintje seed potatoes in the Groningen district of Holland concerning the prevalence of *Rhizoctonia* [*Corticium solani*: *R.A.M.*, 34, p. 315] in the 1955 harvest.

Of the total of 293 plots, only 24 per cent. were free from infection, 50 per cent. were severely attacked, and 26 per cent. slightly. Only 10 per cent. of the tubers were disinfected, but in any case this method of control is inadequate, permitting the development of 67 per cent. black scab as compared with 77 per cent. in the untreated stands. Haulm-pulling has been largely replaced by destruction with chemical sprays, a practice which definitely promotes infection by *C. solani* [35, p. 38], 80 per cent. being present in the 224 sprayed plots as against 57 per cent. in the 39 haulm-pulled. Late lifting also favours an increase of infection and it should not be postponed after mid-August. The disease was rather more severe in plots given soil amendments of stable manure, which should preferably be applied to the stubble of the preceding crop. Infection appeared to spread in the clamps, especially where fermentation developed, and provision should be made for adequate ventilation. Many growers attributed the virulence of the pathogen to the cold, damp spring, which retarded germination and delayed growth. Pre-germination accelerated emergence of the sprouts, and the plants were more thriving when they were not earthed up too soon.

Dykstra (T.). **A new method for screening first-year Potato seedlings for scab resistance.**—*Phytopathology*, 46, 1, pp. 57–58, 1 fig., 1956.

Using the vermiculite method of Houghland and Cash [*R.A.M.*, 34, p. 174] in a modified form, the author obtained very satisfactory results in testing first-year potato seedlings for resistance to scab (*Streptomyces* [*Actinomyces*] *scabies*) at the Louisiana Agricultural Experiment Station, Baton Rouge. Definite information on the reactions of individual seedlings could be obtained a few months after sowing the true seed, the first symptoms being detectable on tubers the size of a pea. The plants are readily pulled from the soil with the tubers attached when a suitable stage for examination or planting is reached, facilitating the selection of healthy tubers from resistant seedlings with no admixture from adjoining plants.

Deslandes (J. A.). **Spongospora subterranea cannot thrive in Brazil.**—*Plant Dis. Reptr*, 39, 11, pp. 825–826, 1955. [Multilithed.]

The importation of seed potatoes into Brazil has hitherto been restricted to shipments free from *Spongospora subterranea* [*R.A.M.*, 31, p. 350] and coming from a locality not affected by the disease. Tests in which infected tubers were planted in various parts of the country have indicated that environmental factors, even in the south and in areas under irrigation, are unfavourable to the disease. The recent decision of the Brazilian plant quarantine officials to allow a certain degree of tolerance of *S. subterranea* in imported seed potatoes appears to be justified.

Bazán de Segura (Consuelo). **La costra plateada de la Papa.** [Silver scurf of Potato.]—*Bol. Exp. agropec., Lima*, 3, 3, pp. 2–6, 1954.

During November, 1954, silver scurf caused by *Spondylocladium atrovirens* occurred for the first time in Peru [C.M.I. map No. 233] on the tubers of 18 potato varieties imported from Holland [see next abstract] and Canada and grown in the Cañete Valley. Indigenous varieties and the imported varieties Furore and Guineke, grown in the same locality, were not affected.

Cristinzio (M.). **La scabbia argentea dei tuberi di Patata.** [Silver scab of Potato tubers.] —*Ric. fitop. Campan.*, 12, pp. 35–47, 2 pl. (1 col.), 3 figs., 1954. [English summary.]

During 1948 silver scab (*Spondylocladium atrovirens*) was observed on a high percentage of seed potatoes imported into Italy from abroad, notably from Holland [see preceding abstract] and Czechoslovakia. The Dutch variety Bintje suffered the greatest damage. Studies from 1948 to 1952 demonstrated that the disease is transmitted through infected seed tubers and that incidence is aggravated by excessive nitrate fertilization. Bintje was the most susceptible variety while Bona and Majestic were fairly resistant and Krasava highly so. The most effective control method was to steep scabbed tubers for one hour in a 0·35 per cent. formalin solution before planting.

Sprau (F.). **Pathologische Veränderungen im Siebteil der Kartoffeltriebe und ihre Verwendbarkeit als Nachweis für das Blattrollvirus.** [Pathological changes in the sieve area of Potato sprouts and their applicability in the diagnosis of the leaf roll virus.]—*Z. PflBau*, 6 [50], 4, pp. 186–192, 1 fig., 1955.

In further experiments at the Bavarian Institute for Agriculture and Plant Protection, Munich [*R.A.M.*, 34, p. 747], the presence of callose substances in the sieve-tubes of potato sprouts stained with resorcin blue again proved to be a reliable diagnostic criterion of infection by the leaf roll virus [cf. 35, p. 316 and next abstract]. The method is deserving of extended trials in conjunction with the eye-cutting procedure, especially in breeding work.

Wenzl (H.). **Die Diagnose der Fadenkeimigkeit an ungekeimten Kartoffelknollen mittels der Kallose-Reaktion.** [The diagnosis of spindle sprout in ungerminated Potato tubers by means of the callose reaction.]—*PflSchBer.*, 16, 1–3, pp. 21–35, 1956. [English summary.]

At the Plant Protection Institute, Vienna, the callose reaction in the sieve-tubes of potato tubers of 14 varieties stained with 1 per cent. reso blue (containing 10 per cent. resorcin) was found to be as reliable in the diagnosis of spindle sprout as in that of leaf roll virus [see preceding abstract], the same callose plugs being present. The method may be applied several months before germination and even after its inception, but in the latter case tests on the heel end of the tubers are not invariably positive for spindle sprout, necessitating a supplementary examination of the crown or central tissues.

No correlation was observed between spindle sprout and the leaf roll virus. There was, however, a correlation between spindle sprout and *Colletotrichum* [*atramentarium*] wilt disease, the latter being, in the author's opinion, probably identical with stolbur [tomato big bud] virus [*R.A.M.*, 35, p. 226 and next abstract].

Mother-tubers giving rise to minute tubers on short, spindling stolons or at the eyes showed the same pathological development of callose plugs in the sieve-tubes as did those with spindle sprout.

Ettig (B.). **Über einen Antagonismus zwischen Bodenbakterien und Colletotrichum atramentarium (Berk. et Br.) Taub.** [On an antagonism between soil bacteria and *Colletotrichum atramentarium* (Berk. & Br.) Taub.]—*Zbl. Bakt.*, Abt. 2, 108, 21–22, pp. 602–610, 9 figs., 1955.

At the Institute for General Botany of the Friedrich Schiller University, Jena,

Germany, 12 out of 42 bacteria (all aerobic spore-formers) isolated from field soil [cf. *R.A.M.*, 35, p. 43] displayed an extraordinary measure of antagonism to *Colletotrichum atramentarium* [see preceding and next abstracts] on potato dextrose agar in Flemming's streak test. On the other hand, the fungus exerted no comparable influence on the bacteria either in the streak test or in Knoll's microtest, with one exception which showed a slight retardation in growth. The acervuli of *C. atramentarium* proved to be much more resistant than the conidia to the bacterial antagonists.

It appears unlikely from these findings that *C. atramentarium* is able to lead a saprophytic existence in the soil. The question remains open, however, whether the acervuli survive and provide a source of infection on rising to the surface. Their comparative resistance to antibiotic influence supports this hypothesis, which is invalidated, on the other hand, by the negative results of all attempts to date, e.g., those of Gemeinhardt (*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 8, p. 226, 1954), to isolate or reisolate the fungus from soil.

Schmiedeknecht (M.). **Untersuchung des Parasitismus von Colletotrichum atramentarium (B. et Br.) Taub. an Kartoffelstauden (Solanum tuberosum L.).** [Study of the parasitism of *Colletotrichum atramentarium* (B. & Br.) Taub. on Potato (*Solanum tuberosum* L.) haulms.]—*Phytopath Z.*, 26, 1, pp. 1–30, 17 figs., 1 graph, 1956.

This is an important contribution from the Institute for General Botany of the Friedrich Schiller University, Jena, Germany, to the history, systematic position, geographical distribution [C.M.I. map No. 190], and host range of *Colletotrichum atramentarium* [*R.A.M.*, 35, p. 225], the author's experimental studies being supplemented by numerous references to literature. Although the fungus was discovered in 1825, the knowledge available today concerning its development and biology is too defective and incomplete for a successful approach to the problem of control through breeding.

The hypothesis that *C. atramentarium* is a secondary invader of potato stems infected by tomato stolbur [big bud] virus [see preceding abstracts] is rejected, the presence of the latter in Germany being as yet unconfirmed.

The appressoria formed by *C. atramentarium* in hanging-drop cultures have been interpreted as chlamydospores [3, p. 167; 4, p. 374], but they do not germinate on transference to a favourable medium, nor are they produced only in starvation cultures. The fungus is, by means of the appressoria, adapted for attachment to the host with the firmness necessary to rupture the cell wall. The acervuli formed on dying potato stems are mostly replaced in pure culture by sclerotia, 0·06 to 3 mm. in diameter, which when placed on potato haulms give rise to conidiophores and setae and so must be regarded as immature acervuli.

C. atramentarium is not exacting in its nutritional requirements, thriving on all kinds of natural and synthetic media and even contriving to subsist on distilled water agar or on pine wood. Enzymes secreted by the pathogen include cellulase, hemicellulase, pectinase, proteases, saccharase, diastase, and inulase. They are concerned in the foot rot stage of the disease, involving the disorganization of the underground system, while the wilting of the aerial organs is a remote effect of the operation of toxins.

The potato wilt fungus is a hygrophilous species, with an absolute humidity minimum of 90 per cent. The osmotic pressure of its cells lies above 100 atm.

The results of the author's experiments corroborated Gemeinhardt's findings [see preceding abstract] regarding the improbability of infection through the soil. It was definitely ascertained, however, that the fungus is transmitted from a diseased plant through the daughter tubers, while new plants are infected from dead material by means of spores. Roots and stems are invaded through the

epidermal cells by the development of appressoria and cellulose infection plugs. Green leaves are not attacked at all, while chlorotic ones react to spraying with a conidial suspension by the production of numerous, minute necroses. Histological examination revealed penetration as far as the epidermis only, any further advance into the palisade or spongy parenchyma being debarred by the defensive necroses.

In the deeper layers the pathogen frequently passes straight through the cells instead of first filling each one with mycelium before proceeding further. Eventually an entire section of the tissue becomes permeated by the fungus, a process more readily observed under experimental conditions than in the field, where the advance of infection is very slow on account of the long incubation period—from the spring until after flowering. The adventitious roots offer the least resistance and are very soon completely invaded by the fungus. The acervuli also mature in this region; elsewhere they develop only in dead tissues, mostly between the cortex and the central cylinder, the central cylinder and the medulla, and on the edge of the medullary cavity.

In dual culture experiments with *C. atramentarium* and *Rhizoctonia* [*Corticium*] *solani*, the latter overgrew the former but did not prevent its development or the production of sclerotia. Similarly, in tests on sprouts in the hygrostat the first symptoms were those of stem canker, but later the sclerotia of *Colletotrichum atramentarium* appeared on the roots and gradually extended further over the system, until the whole sprout finally succumbed to the joint attack of both pathogens.

Cultural measures for the control of *C. atramentarium* should include thorough sorting and disinfection of seed tubers [3, p. 236] and destruction of the haulms at the latest in the spring before sprouting. There are also possibilities of breeding for resistance, for in stems of the susceptible variety Aquila, for instance, infection progressed three times as far during the same period as in the resistant Capella.

Focke (R.). **Der Einfluß von Auspflanzzeit und Vorkeimung der Kartoffel auf die Höhe der durch Rhizoctonia solani hervorgerufenen Schäden.** [The influence of planting-out time and pre-germination of the Potato on the extent of the damage caused by *Rhizoctonia solani*.]—*Wiss. Z. Univ. Rostock*, 1, 2, pp. 47–54, 1952. [Received 1955.]

In experiments from 1949 to 1951 at the Institute for Agriculture, University of Rostock, Germany, infection of potatoes by *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, 35, p. 222] was more severe in May- than April-planted tubers and was reduced by pre-germination. On an average, the yield reductions in pre-germinated, not pre-germinated, and late-planted tubers were 15·2, 21, and 30 per cent. of those from uninoculated stands. The losses were heavier in the Flava, Mittelfrühe, and Sabina varieties than in Johanna, Voran, and Ackersegen. The average numbers of stems produced by inoculated and uninoculated tubers were 3·5 and 4·6, respectively.

'White hose' alone is considered to be an unimportant symptom of infection by *C. solani*, being a consequence of dense planting and high humidity; it does not affect the yield and should be disregarded in assessment for certification. On the other hand, apical rolling is an expression of severe damage, which is reflected in reduced yields, and its influence extends to succeeding crops.

The presence of numerous sclerotia (0·4 gm. per tuber) on the planting material resulted in a yield reduction of 32 doppelzentner [1 dz. = about 2 cwt.] per ha., but the normal quota of 30 mg. caused no adverse effect. In a test with Erstling [Duke of York] the average weight of the sclerotia on tubers lifted on 10th July was 15 mg.; 40 days later it was about 60 mg. It was estimated that under the experimental conditions there was an increase of 1 mg. sclerotia per tuber for each day's delay in lifting, so that a postponement of 10 days in digging a crop of 480,000 tubers per ha. would result in the addition of some 4·8 kg. sclerotia.

WESTPHALEN (BRIGITTA V.). **Untersuchungen über Alternaria porri (E. M.) Neerg. f. sp. solani als Knollenparasit.** [Studies on *Alternaria porri* (E. M.) Neerg. f. sp. *solani* as a tuber parasite.]—*Phytopath. Z.*, 25, 4, pp. 385–417, 20 figs., 2 graphs, 1956.

The author's studies on a dry rot of potato caused by *Alternaria solani* at the Phytopathological Institute, University of Bonn, Western Germany [*R.A.M.*, 33, p. 554], are fully described and tabulated. The decay may assume two forms: in one the rotted areas are comparatively large but the tissue is penetrated to a depth of only about 0·8 cm., the skin over the spots appearing grooved and the surrounding healthy portion raised like a pad; in the other the spots are smaller but the tuber may be invaded right to the centre. The former type has hitherto been regarded as typical, but the latter is unquestionably responsible for substantial losses in winter storage, involving a large part of the flesh and paving the way for secondary organisms which complete the destruction of the tubers.

Three other pathological conditions present symptoms that may well be confused with those of *A. solani*. They are a tuber necrosis of the Deutsche Erstlinge variety, probably of physiological origin; the dry rot caused by *Phoma foveata*, distinguishable from *A. solani* in the later stages only by its shallower depth of penetration; and the small, sunken spots on the skin known in the United States and Great Britain as 'pit rot' [33, p. 444] and attributable to overdosage with chemicals in tuber disinfection.

In general, the spread of dry rot in cellar storage following serial inoculations of the tubers with three isolates of *A. solani* at temperatures rising from 5° to 15° C. was inconsiderable; in a controlled temperature chamber at 26° the rotted areas expanded to some extent, but even here the decay had not attained any great importance by the turn of the year.

For six of the varieties tested, i.e., Vera, Deutsche Erstlinge, Frühmölle, Magna, Capella, and Alpha, the optimum temperature for infection agreed with that for the development of the pathogen *in vitro* (26°). For the other three (Bona, Speisegold, and Toni) it appeared to be about 16°. Such varietal disparities probably account for the conflicting reports of different workers on the temperature relations of *A. solani* [cf. 8, p. 124; 28, p. 542]. The observed resistance of the late varieties (Magna, Capella, and Alpha) was confirmed by experiments.

The isolates used in the inoculation experiments were taken from potato leaves and tubers and tomato fruits; only the leaf isolates were pathogenic to the tubers.

The results of analyses on eight varieties yielded no evidence of any relationship between the sugar content of the tubers and their reaction to *A. solani*.

The sole practicable measures for the reduction of losses from this dry rot in storage are the maintenance of temperatures below 10° C. and constant supervision of the planting material in the pre-germination rooms.

Rules for regulating the import of fungi into India.—*Plant Prot. Bull., New Delhi*, 5 (*1953*), 4, pp. 99–100, 1955.

An order of 1943 prohibits the import of living fungi, in culture or otherwise, into India except they be consigned to the Indian Agricultural Research Institute, New Delhi, or the Forest Research Institute, Dehra Dun, or be accompanied by a special permit issued by either of these institutes.

WILSON (J.). **Plant quarantine for the Caribbean.**—*Commonw. phytopath. News*, 2, 1, pp. 1–3, 1 fig., 1956.

The British Caribbean territories are served by the Central Plant Quarantine Station at the Imperial College of Tropical Agriculture, Trinidad. The isolation of the ten component territories facilitates the enforcement of plant import regulations [*R.A.M.*, 34, p. 627]. Since 1952, when the Station was completed, sugar-cane, forage grasses, and bamboos have been quarantined in the enclosed, air-conditioned

greenhouse. Under tropical conditions air cooling under a glass roof is very difficult and some structural modifications are envisaged. Cuttings from mature sugar-cane plants are grown in the greenhouse, the parent plants destroyed, and clean cuttings of the second generation distributed. Before dispatch, all cuttings are given hot-air treatment at 54° C. for eight hours, dipped in shirlan and dried, and the cut ends sealed with candle wax. For journeys of more than two or three days the cuttings are wrapped individually in newspaper and sealed in polythene bags; by this method they have been sent in good condition from Trinidad to Kenya.

Cacao is imported as bud wood and only by the Imperial College of Tropical Agriculture Cacao Research Scheme. It is proposed to move the intermediate quarantine nursery for cacao from St. Vincent, where commercial plantations have recently been established, to Barbados. Banana plants from outside the Caribbean are imported only after intermediate quarantine at Kew. The entry of raw coffee and any kind of citrus is prohibited.

SHEFFIELD (F[RANCES] M. L.). **Plant quarantine in East Africa.**—*E. Afr. agric. J.*, 21, 1, pp. 10–17, 2 figs., 1955.

The essential information in this paper describing the recently opened East African Plant Quarantine Station at Muguga, Kenya, and its functioning, has already been noticed from another source [*R.A.M.*, 35, p. 149]. In an appendix, the sugar-cane varieties known to be in East Africa are listed.

FOLLIN (C.). **Revision av 'förbjudna listen'.** [Revision of the 'prohibited list'.]—*Växtskyddsnotiser, Stockh., 1955*, 4, pp. 67–69, 1955.

Among the additions to the existing list of pathogens to be excluded from Sweden by legislation prohibiting the introduction of infected material are *Synchytrium endobioticum* (the previous regulations [*R.A.M.*, 15, p. 608] did not refer to the import of potatoes), *Corynebacterium sepedonicum*, *Phytophthora fragariae*, *Ophiostoma* [*Ceratostomella*] *ulmi*, *Chalara quercina*, and *Cronartium harknessii*, the agent of a destructive pine disease in the United States [32, p. 111].

List of intercepted plant pests, 1954.—*S.R.A., Bur. Ent., Wash.*, 61 pp., 1955. [Received February, 1956.]

During the period from 1st July, 1953, to 30th June, 1954 [cf. *R.A.M.*, 34, p. 515], Japan was again the major source of interceptions of *Xanthomonas citri* [35, p. 284; C.M.I. map No. 11], the hosts including sweet orange, lemon, sour, mandarin, and 'summer' oranges, sour lime, and *Citrus ichangensis*. It was also present in lesser amount on mandarin orange and orange peel from China, sour lime from India, lemon and orange from the Philippines, pomelo from Formosa, lime from Guam, sour lime from Java, and grapefruit from Thailand.

Most of the 62 interceptions of *Elsinoe australis* [No. 55] were on lemon, sweet and sour orange, and sour lime from Brazil (38), 21 from Argentina on lemon, orange, and mandarin orange, two from Uruguay on orange, and one from Paraguay on grapefruit.

Among other pathogens intercepted in air-transported material were *Chrysomyxa rhododendri* [*R.A.M.*, 33, p. 522] on rhododendron from Switzerland and Austria; *Cryptospora longispora* on Norfolk Island pine [*Araucaria excelsa*] seed from Norfolk Island; *Fusicladium eriobotryae* on loquat [31, p. 335] from the Azores; *Phoma* [*Guignardia*] *citricarpa* [C.M.I. map No. 53] on lemon from Australia and New Zealand, mandarin orange from China, and citrus peel from China and Hawaii; *Sphenospora kevorkianii* on an orchid (*Stelis* sp.) from Trinidad; and *Elsinoe phaseoli* [No. 194] on Lima bean [*Phaseolus lunatus*] from Puerto Rico.

Cargo from Cuba was found to harbour *Phoma sabdariffae* on kenaf *Hibiscus* [*H. cannabinus*: cf. *R.A.M.*, 33, p. 481], while *Tolyposporium ehrenbergii* was detected on sorghum seed from India [33, p. 525] and *Urocystis gladiolicola* on gladiolus [32, p. 483] from Holland, both in mail.

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